

## **Analysis of Urban Sewage Treatment in Environment Engineering**

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**Abstract.** At the present stage, with the continuous deepening of urbanization of China, the urban population increases day by day. As a result, water demand and urban sewage discharge also grow. Nowadays, some factories in peri-urban areas violate laws to discharge wastewater, which greatly threatens our water security, production and living. Thus, the departments concerned should lay stress on sewage treatment, and introduce advanced sewage treatment technology. This paper is written to analyze the current situation of urban sewage treatment in environment engineering, advanced sewage treatment technology and the development tendency, and put forward measures for improving urban sewage treatment, for reference.

### **Introduction**

Presently, as urban scale expands, various problems in urban construction emerge. The industrial development in peri-urban areas markedly impact the fresh water resource. If industrial sewage is discharged without treatment, pollutant or solid waste will be brought to the waters nearby, and the waters will become eutrophic. Such problems will have bad influence on people's daily water usage and health. To promote urban sustainable development, local environmental supervising departments should attach importance to the treatment of water resource and environmental pollution.

### **Current Situation of Urban Sewage Treatment in Environment Engineering in China and Analysis**

Presently, the proportion of the treated sewage to the total amount of sewage discharge is low. The urban sewage treatment mode has evolved from allowing discharge as long as individual containment remains within the content standard plus treatment at the pollution source to area-delimited comprehensive pollution control plus pollutant discharge total amount control based on environment capacity. The existing urban sewage treatment plants in China are characterized by large scale, large floor area, large capital input, stably running, long service life, low unit treatment cost, high economic benefits, etc[1]. Nevertheless, the departments concerned still need to introduce advanced treatment technology from abroad based on particular conditions, learn from excellent foreign achievements, and deliberately select treatment scheme and technology, to facilitate the operation and maintenance of urban sewage treatment system, reduce the cost, and make urban sewage treatment plants play a distinct role in urban environment protection.

### **Harm of Untreated Urban Sewage to Environment and Analysis**

The main domestic sewage sources include household, enterprises, and urban public facilities. Urban sewage mainly contains such pollutants as saccharides, mineral oil, etc., of which the chemical oxygen demand, biological oxygen demand, total nitrogen content and total phosphorus content are high[2]. Hence, if a large quantity of sewage is discharged into waters and soil without treatment,

the ecological balance of waters and soil will be damaged, extinguishing organisms in waters, and destroying the natural ecology. For example, the chromium content in crops growing in a land contaminated by heavy metals and synthetic organics will be excessively higher than the limits. The discharge of untreated sewage into farmland will lead to decline of crop yield and nutrient content. Heavily contaminated crops will bring pathogen to human body, so that human will suffer diseases or death after eating such crops. In the past, sewage plants were just capable of reducing the chemical oxygen demand and biological oxygen demand of sewage, and could do nothing for the total nitrogen content and total phosphorus content. If sewage with high total nitrogen content and total phosphorus content is discharged, the waters will become eutrophic, and the quantity of alga in waters markedly increases. The metabolism and massive dead of alga will deteriorate water quality, stink the waters, and heavily pollute the environment.

## **Process and Plan of Urban Sewage Treatment in Environment Engineering**

### **Evaluation on Urban Sewage Treatment Process**

The evaluation of urban sewage treatment method should focus on the rationality and practicability. The factors influencing the rationality and practicability include treatment capacity, sewage water quality, water environmental function in the area of sewage discharge, and the development level of the city where sewage treatment plant is located, etc.

### **Quality of Urban Sewage**

No matter what category the industrial sewage falls into, its quality is required to reach the relevant standard values as specified in the Integrated Wastewater Discharge Standard for being treated in an urban sewage treatment plant. If toxic and harmful substances are contained, then it is not allowed to be treated in a sewage treatment plant. In the process of sewage treatment method evaluation, the quality characteristics and contamination ingredients of the sewage allowed to be treated in sewage treatment plant should be thoroughly tested and inspected, and rational analysis and prediction should be performed on this basis. The abovementioned test and inspection cover the proportion of various industrial sewages, discharge behavior, contamination composition, and concentration of major contaminations.

### **Methods of Urban Sewage Treatment**

In the development process of urban sewage biological treatment, activated sludge process, biofilm process and oxidation play an important role.

#### *Biofilm Process*

The application principle of biofilm process is to get rid of dissolved organic pollutants in sewage. Specifically, microorganism attaches to the surface layer of filtration medium to form a biofilm, and the microorganism decomposes dissolved organic pollutants and turns them into microorganism cytoplasm when sewage touches the biofilm, to thoroughly purify sewage. This method requires biological rotating disk, biological filter, biological oxygen removal equipment, and biological fluidized bed. It has the advantages of high treatment efficiency, high impact resistance, low sludge production, small covering area, simplicity and convenience of operation[3]. Thus, this method is widely used.

#### *Activated Sludge Process*

The fundamental principle of activated sludge process is to culture aerobic microorganism in sewage to form sludge-like flocculating matters, namely activated sludge, and use the activated sludge to absorb and degrade organic matters in sewage, to purify sewage. The main steps are: pump air into the sewage to be treated to culture aerobic microorganism to form sludge-like flocculating matters; guide the sewage into a sedimentation basin for plain sedimentation. Activated sludge can absorb, oxidize and decompose organic matters in sewage, and condense and settle organic matters, to clarify sewage at final.

### *Oxidation*

Oxidation, or sewage oxidation, mainly includes chemical oxidation, wet oxidation, catalytic oxidation, photocatalytic oxidation and supercritical oxidation[4], and refers to degrading wastewater pollutants with strong oxidant. It is a main method of industrial sewage pretreatment. Chemical oxidation is simple, but its effect is not satisfactory, and the cost is high. Therefore, chemical oxidation will not be used for urban domestic sewage treatment. Concerning photocatalytic oxidation, the cost is low, the effect is satisfactory, the equipment are easy to operate, the oxidizability and sterilizing effect are good, and with this method, sewage can be thoroughly treated. Hence, this method is promising in organic sewage treatment and advanced sewage treatment.

### **Recovery and Recycling of Urban Sewage**

Urban sewage itself is of certain utilization value. In the process of urban sewage treatment, consideration should be given to resource utilization of urban sewage. As a kind of urban water resources, urban sewage can be recovered and recycled for industrial or municipal watering and greening after being treated, to largely relieve the water supply pressure due to water shortage. Hence, besides constructing sewage plant, importance also should be attached to the construction of sewage recovery and recycle project. In the process of evaluating urban recovery and recycle, the utilization, effectiveness and possible environmental problems should be taken into account.

## **Development Tendency of Urban Sewage Treatment Technology in China**

### **Membrane Bioreactor (MBR)**

MBR is a sewage treatment process emerged in the late 20th century. It consists of membrane separation technique and biotechnology. This method is to precipitate and filter pollutants with micro-filtration membrane separation technique, and keep activated sludge of an ultra-high concentration in the biochemical pool. The water treated with this process is of good quality, hardly containing bacterium or suspended solid, and nearly not muddy. Besides, some contaminants of biological origin such as fecal coliforms can be removed, and the treated water can be directly recycled. Comparing with traditional biological treatment process, it has many advantages, including strong impact resistance, high effluent quality, small covering area, high biological efficiency, and high degree of automation, etc[5].

### **Biofiltration Oxidation Reaction Pool (BIOFOR)**

BIOFOR refers to advanced sewage treatment based on biochemical sewage treatment based on physicochemical sewage treatment. Comparing with ordinary secondary effluent quality, this process is superior in respect of effluent quality, which reaches the relevant standards of low-grade backwater. It mainly integrates the effects of rapid coagulation, inclined plate sedimentation, and sediment by rotational flow. With this process, the removal of suspended solids (SS) up to 85% can be realized, and the removal of BOD can reach 60%, to lay a foundation for subsequent advanced treatment.

### **Membrane Biological Fluidized Bed (MBFB)**

MBFB can further reduce COD, NH<sub>3</sub>-N and turbidity, etc. via the function of biological fluidized bed and ceramic membrane separation system on the premise of discharge on standard of the original sewage. It can take the place of complex sand filtration, cartridge filtration, ultrafiltration, and the like to become a process immediately before RO reverse osmosis membrane desalting treatment, and also can prolong the service life of RO reverse osmosis membrane by reducing the organic content in sewage. Besides, with this process, sewage resources can be directly recovered and recycled, to reduce the cost of recycle water treatment.

### **BIOSTYR**

It is a kind of up-flow biological aerated filter. Biological filter and pretreatment constitute the overall flow of BIOSTYR. The two units are arranged closely, so the covering area is small. This process can

not only be used for advanced sewage treatment like effluent recycle, but also run for secondary sewage treatment.

### **Problems of Urban Sewage Treatment in China and Countermeasures**

In this phase, there are still many problems in urban sewage treatment. For example, some cities are short of funds for sewage treatment, the construction is not scientific, the utilization rate of reclaimed wastewater resource is low, the drainage pipeline network is not scientifically arranged, or some factories discharge sewage with a excessively high content of toxic and harmful substance. To tackle these problems, the following measures are proposed:

#### **Broaden the financing channels to raise funds for constructing drainage pipeline network.**

Shortage of fund is a common problem in environment engineering in most cities, and also an unavoidable problem in the sewage treatment industry. To overcome the difficulty of fund shortage, urban sewage treatment enterprises should innovate their management mode to gradually marketize sewage treatment, broaden their financing channels, and increase funds for drainage pipeline construction. Besides, the mode of entrustment management is recommended to update the management concept and idea, and open a new pattern of sewage treatment.

#### **Innovate and improve recycling method of water resources.**

Urban sewage treatment plants should take measures to maximize the resource utilization efficiency of sewage, introduce new sewage treatment technology, improve sewage treatment process, and expand the utilization way of reclaimed water resources, such as using reclaimed water in urban construction and planning, and industrial and agricultural production after water quality classification.

#### **Adopt advanced sewage treatment process**

Sewage treatment process decides the treatment ratio of urban sewage. To serve the purpose of environmental protection, sewage treatment plants should select a cleaner production technology with low productivity of pollutant, high resource utilization rate, meeting the requirements of urban water pollution control, and helpful for comprehensive utilization. Concerning cleaner production technology of sewage treatment plants, the quantitative indexes include rate of sludge formation, covering area per unit wastewater treatment, water resource consumption rate, and energy consumption per unit wastewater treatment, etc. Activated sludge process is a method commonly used in urban sewage treatment, which largely reduces organic loading and energy consumption. Thus, it is rational to adopt activated sludge process. In recent years, activated sludge process has become a main trend in urban sewage treatment. In respect of sewage treatment process, however, relevant researchers should make greater efforts to explore and develop new sewage treatment method and process with low cost and low resource consumption based on the national conditions and actual urban development of China.

### **Conclusion**

To sum up, urban sewage treatment in environment engineering is a tough task. It is because of this that we should stick to sustainable development, and can never resort to the strategy of “growing first, cleaning up later” . In the flourishing of China’ s socialist market economy, the economic benefits from industry has made a large contribution. The acceleration of industrialization, however, damaged the natural environment. Therefore, we should find a way to harmonize with environment, emphasize the utilization of fresh water resources, and always pay attention to urban sewage treatment. Though we have made some achievements in the development and research of urban sewage treatment technology, we still should make great efforts to innovate and improve the existing technology to be more perfect and mature, so as to further optimize urban sewage treatment and support environmental protection.

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