

Status and Technology Research of Rural Sewage Treatment

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Abstract

In recent years, water resources and land resources in rural areas have been seriously affected by sewage. In order to ensure the living environment of rural residents, the treatment of rural sewage is imminent. Based on rural sewage treatment, the characteristics of rural sewage and the problems faced in sewage treatment were introduced, the current sewage treatment technology commonly used was briefly analysed and discussed, and suggestions for the development of rural sewage treatment in the future were proposed.

Keywords

Rural Sewage; Sewage Treatment; Treatment Technology.

1. Introduction

With the continuous development of the country's economy and the continuous advancement of ecological culture construction, rural revitalization has been put on the agenda, and the quality of life in rural areas has been greatly improved. At the same time, there are many environmental problems in rural areas, the most prominent of which is rural water pollution. The rural water body environment pollution has severely damaged the rural ecological environment and made the loss of balance in the ecological environment. This will not only destroy the living environment of rural residents, but also have negative effects on farmland to get irrigation of high-quality water sources, which directly threaten the sustainable development of rural and agriculture. Therefore, rural sewage treatment is a problem that needs to be solved urgently. It is not only the main content of promoting environmental governance, but also the urgent demand of rural residents [1]. In solving the problem of rural sewage treatment, we must adhere to adapt to local conditions in order to achieve the best treatment effect. Based on the aforementioned content, this article summarizes the problems facing rural sewage treatment in the country and the technology used in rural sewage treatment at this stage to analyze the sewage treatment technology that can apply to different rural areas.

2. The Current Situation of Rural Sewage Treatment

2.1 The Characteristics of Rural Sewage

(1) The scope of pollution is large and the emission is dispersed. Most rural residents in China have a relatively wide and non-concentrated residential area. Affected by groundwater levels and terrain, sewage discharge also has a dispersed characteristic, which makes it difficult to collect and treat sewage. In addition, in many rural areas, the sewage discharge and treatment systems are relatively backward, and the residents' environmental protection awareness is weak. The phenomenon of direct

discharge of untreated domestic sewage to the river ditch appears, which causes serious pollution to the rural environment and water bodies and can easily cause the spread of the disease.

(2) High organic matter content. The rural sewage is mainly derived from toilet dung and its rinse water, bath wastewater, animal husbandry wastewater and kitchen catering water, etc., which contain higher Chemical Oxygen Demand (COD) and nitrogen phosphorus pollutants. It is easy to lead to excess nutrition in rivers and soil, thereby breaking the ecological balance of the river and soil, and causing the eutrophication of rivers and soil.

(3) Intermittent emissions and large differences of water quality. Because the development characteristics of various rural economy are different, the emission water quality and discharge time of different rural sewage are different, and the daily change coefficients are large, generally 3.0-5.0. The discharge pattern mainly presents two peak periods: early and late, while the amount of sewage generated during the rest of the time is very small. In addition, influenced by various factors such as crops, rainfall and geographical environment, rural sewage also exhibits seasonal discharge patterns, resulting in significant differences in discharge between different regions and season [2].

2.2 The Facing Problems of Rural Sewage Treatment

The treatment of rural sewage started relatively late in China, and it faces the following problems:

(1) Residents' environmental awareness is weak. Rural residents generally lack the concept of environmental protection. Most of rural areas do not have sewage collection and treatment equipment. In addition, the construction of sewage treatment equipment needs to invest a lot of funds in the early stage. Many residents are unwilling to bear this cost, resulting in difficulty in the progress of rural sewage treatment.

(2) The layout of the pipe network is difficult. The buildings in rural areas do not have reasonable planning and layout. In villages and towns with dense population residence, their roads are also narrow. This will lead to problems such as increased construction difficulties, difficulty laying of sewage pipelines, improved construction costs and slow laying progress.

(3) Lack of sewage discharge standards. At present, the discharge of rural sewage has no uniform standards. Compared with cities, the key problem of rural sewage pollution is eutrophication due to nitrogen and phosphorus. the cost and technical requirements will be improved according to the treatment standards of urban and towns, while the management level and economic level in rural areas are generally weak, so copying the standard of urban sewage treatment is not very reasonable.

(4) Lack of operation management. After the sewage treatment equipment is completed, the operation management and responsibility subject of the equipment refers to is unknown. Due to the lack of professionals for maintenance and management, the equipment is not repaired in time when the equipment operation fails, and the equipment is abandoned.

In summary, in terms of implementing rural sewage treatment policies, it is necessary to choose a processing process that is targeted, economic efficient, simple management and maintenance and acceptable to residents.

3. Rural Sewage Treatment Technology

At present, there are many technologies that can be used to deal with rural sewage. Each process has its advantages and disadvantages. In the sewage treatment, the best technical process is selected according to the specific situation of the countryside. The technical division of rural sewage treatment is as follows:

3.1 Anaerobic Biogas Digester

Anaerobic biogas digester technology utilizes organic matter such as human and animal manure to generate clean energy such as methane under anaerobic conditions through microbial energy metabolism and respiration in the digester. This technology can effectively treat COD, Biochemical Oxygen Demand (BOD) and pathogenic microorganisms in rural sewage, and the treated sewage and

sludge have high fertilizer efficiency, which can be reused by farmers. The anaerobic biogas digester can also produce biogas, which has the high heat and will not produce toxic gases when it burns. It is an ideal choice for renewable clean energy. The anaerobic biogas digester appears in various forms, but no matter what the actual structure is, it has a relatively simple common characteristics [3].

3.2 Artificial Wetland Technology

Artificial wetland is a sewage treatment technology that belongs to ecological treatment, mainly utilizing wetland ecosystems to treat sewage by physical sedimentation, chemical action and biological action. Artificial wetland technology has been widely used due to the advantages of low investment, low energy consumption, low operating costs, effective treatment effects and environment friendly. However, artificial wetland covers a large area and has higher requirements of the topography. And it is sensitive to the change of season, the efficiency of the removal of organic matter and ammonia nitrogen is low at low temperature. The actual operation process is easily affected by the problem of the obstruction of the matrix, which is the main obstacle to the development of artificial wetlands, it should be focused on in later research.

3.3 Membrane Biological Reactor

Membrane biological reactor (MBR) is a sewage treatment technology combined by the active sludge and membrane. Due to the efficient interception of the membrane, it can intercept macromolecular organic matter that is difficult to decompose by microorganisms. It can improve the water quality of the effluent, reduce the amount of the sludge, improve the treatment efficiency and promote the recycling of water resources. In the demonstration project, the combination of A2/O-MBR integrated equipment is used to deal with rural sewage. The water quality is better than level A of GB18918-2002 (urban sewage treatment plant pollutant emissions standard) [4]. The MBR composite process has the advantages of small area, stable operation, strong impact resistance and good water quality. However, the membrane of MBR is prone to be blocked and difficult to clean, and the energy consumption is high, the cost of investment and maintenance is high, so it is suitable for rural areas in the east.

3.4 Stabilization Pond

Stabilization pond technology is a low-cost and efficient sewage treatment method. The land is built to form the pond by appropriately artificially alteration, and the embankment and impermeable layer are set. Organic substances are mainly removed through microbial degradation, organic matter adsorption, organic particles settlement and filtering. The stabilized pond technology is also very suitable for sewage treatment in rural areas. It can make full use of rural farmland and ditch, and can not only achieve the purpose of sewage resources, but also achieve the purpose of energy -saving economy. However, traditional stabilization ponds also have defects such as covered large area, long hydraulic stay, unstable treatment effects, emitting odor, and treatment effects greatly affected by climate conditions [5]. Therefore, to deal with these defects, there are continuously optimized and developed new stable ponds, such as multi -level tandem ponds and breeding ponds. At present, various stabilization pond technology and its combination technology have been developed relatively well, and can be effectively used for rural sewage treatment.

3.5 Soil filtering Technology

The soil filtration system is a traditional method of sewage treatment. The sewage is treated by the composite of soil-plant-microorganisms and physical and biochemical effects such as interception, precipitation, adsorption, collaterals and microbial degradation. In the process, nutrients, such as nitrogen and phosphorus, as well as water, can be reused. The removal of nitrogen mainly includes plant absorption, biological denitrification and ammonia nitrogen volatilization, and biological denitrification plays a major role [6]. This process has the characteristics of less investment, easy to maintain management, and is suitable for rural areas with high soil permeability, relatively decentralized living, small population density and relatively backward economic development. However, traditional soil filtration systems are prone to blockage during the processing of sewage.

Even so, the soil filtration system is still a sewage treatment technology that is suitable for rural areas in China. Because it can solve the problem of low sewage treatment capacity caused by factors such as funding, technology and talents to a certain extent.

4. Summary

Rural sewage treatment is an important part of rural living environment improvement, an important component of new rural construction, an important measure for implementing the rural revitalization strategy, and an inherent requirement for building a moderately prosperous society in all respects. At present, rural sewage treatment in China has received widespread attention and governance work is urgent. In the process of carrying out rural sewage treatment work, combined with local environment, terrain, population density, sewage treatment facilities, technical level of management personnel, the appropriate treatment modes and process technologies should be selected based on the characteristics of different rural sewage. At the same time, the feasibility and applicability of investment, management and maintenance also should be considered as much as possible to ensure the effective operation of rural sewage treatment facilities. Enable the selected sewage treatment technology to better ensure the construction of rural ecological environment.

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