

LETTER TO THE EDITOR**The Treatment Method of Activated Sludge of Rural Domestic Wastewater Based on Ecological Protection**

Qi Wu*

School of Energy and Architecture, Xi'an Aeronautical University, Xi'an 710077, China

*Email: 62010375@163.com

Up to now, China has not formulated a national discharge standard for rural domestic wastewater treatment facilities, and rural domestic wastewater treatment facilities can only temporarily implement local discharge standards, or apply urban sewage discharge standards, but these standards have big differences, poor applicability, poor use effect and other problems. Combined with activated sludge treatment technology, a method of activated sludge treatment of rural domestic wastewater based on ecological protection was proposed. The current situation and existing problems of rural domestic wastewater collection and treatment were analyzed, and the research progress of activated sludge method for wastewater treatment was fully discussed. The experimental results show that the removal rate of COD increases with the increase of activated sludge concentration, which fully demonstrates the effectiveness of the proposed method.

Ecological and environmental protection; Rural; Domestic wastewater; Activated sludge; To deal with

1 Introduction

China is rich in water resources. According to data statistics, the total amount of potable fresh water is 2.8 trillion m³, accounting for 6% of the global total water, ranking top in the world, only behind Brazil, Russia and Canada. The per capita amount is only 2200m³, only accounting for one quarter of the average per capita water in the world. Secondly, the distribution of water in China is very uneven with the geographical distribution, generally more in the southeast and less in the northwest. In the past, a lot of domestic wastewater was discharged into nearby rivers and streams without treatment, causing serious water pollution and aggravating the situation of water resources shortage. In view of this situation, the state began to pay attention to domestic wastewater treatment, large-scale construction of sewage treatment plants, improve the sewage collection rate. By the end of 2013, China had 1,736 sewage treatment plants, 66 more than the previous year, with a daily treatment capacity of 124.54 million m³, an increase of 6.1 percent over the previous year, and a drainage pipe length of 465,000 km, an increase of 5.9 percent over the previous year. At present most of the sewage treatment plant is distributed within the city, township, county, and rural life waste water is in a state of neglect, arbitrary emissions, causing serious pollution, the village near water together with such a small water area is lesser, liquidity, led to the loss of self-purification of the water body function, eventually open gutter, damage the overall living environment in the countryside, to the life of people bring so much inconvenience.

Xiaoqiang Liu, Yanhua Yang, Wenbin Pei, Long Wang, Jiandong Li published an article entitled “study on the

coagulation characteristics of heavy metal contaminated sludge” in the journal of Ekoloji (issue 106,2018).In this paper, heavy metal pollution sludge such as chromium and zinc was taken as the research object, cement, mineral powder and sludge were taken as the curing materials, and orthogonal design was adopted to study the strength and concentration of heavy metal pollution sludge after curing.(Liu et al., 2019) The results show that the cement, mineral powder and sludge as the main curing materials, the curing agent prepared in a certain proportion can effectively control the leaching of heavy metal ion concentration in the contaminated sludge, and greatly improve the unconfined compressive strength of the contaminated sludge. The experimental results show that the unconfined compressive strength of contaminated sludge can be increased to more than 1MPa by adding 15% sludge curing agent, and the strength can be increased to 1.5 times of the original strength by adding certain amount of activator. The leaching concentration of heavy metal ions can reach the limit required by the existing standards, providing scientific data support and reference basis for the resource utilization and harmless treatment of heavy metal contaminated sludge.

In the literature (Zhang et al. 2016), the degradation mechanism of thiocyanate (SCN⁻) from the inlet and outlet water quality and activated sludge of A/A/O coking wastewater treatment plant was studied by spectrophotometry and ion chromatography. The results showed that SCN⁻ was mainly degraded and removed in the aerobic unit of A/A/O process. Activated sludge under normal temperature (25 °C) on the kinetics of degradation of SCN⁻ in line with the mic equation, V_{max} 11.15 mg SCN⁻, MLSS (g - 1), h - 1, Km, 44.96 mg · L⁻¹; 15 °C low temperature significantly reduced the degradation of SCN⁻ rate; Under 15 °C, 92.62 mg · L⁻¹ SCN⁻ can be degraded completely within 24 h, N and S elements accordingly to generate the NH₃ and NO₂⁻ and S₂⁻, intermediate metabolites and eventually translate into product SO₂ and NO₃⁻; The conversion rates of N and S elements are 94.32% and 99.08% respectively, which basically conform to the law of conservation of materials, indicating that the elements N and S in SCN⁻ can be completely degraded into no₃⁻ and so₂⁻ in the aerobic tank. These results are of great significance for understanding the functions of aerobic ponds and improving the SCN⁻ removal rate in coking wastewater.

Literature (Zhang et al. 2015) studied the effects of different concentrations of cyanide wastewater on microbial toxicity, and preliminarily inferred the mechanism of biodegradation of cyanide. The results showed that the cyanide had inhibitory effect on the metabolism of microorganism in the range of 0 ~ 2.0 mg/L, but the lethal concentration was not reached. (Aratboni et al., 2017)The nitrification process was completely inhibited when the mass concentration of cyanide was 2.0 mg/L. The inhibition of cyanide on microbial denitrification is mainly in the first step of denitrification, that is, the process of nitrate nitrogen to nitrite nitrogen; The mechanism of microbial degradation of cyanide is that cyanide is converted into ammonia nitrogen, and finally into nitrite nitrogen and nitrate nitrogen.

In view of the above problems, this paper proposes a method for the treatment of activated sludge from rural domestic wastewater based on ecological environmental protection.

2 Idea Description

With the continuous improvement of people's living standards, the requirements for environmental quality are increasingly high, and the treatment of activated sludge in rural wastewater has also been promoted to a crucial position. Although there has been some progress in the collection and treatment of activated sludge of rural domestic wastewater, there are still some problems in the collection and treatment of activated sludge of rural domestic wastewater due to the restrictions of rural environment and rural conditions, and there is still a lot of

room for improvement in the development of wastewater treatment.

Activated sludge treatment of domestic wastewater is an example of early application of biotechnology, but it has not lost its application status because of the passage of time. And through the efforts of several generations of scientists, they have absorbed the latest research results from other fields in the treatment of domestic wastewater. The following will adopt activated sludge method to treat rural domestic wastewater.

2.1 Current situation and existing problems of rural domestic wastewater collection and treatment

For a long time, rural environment has been neglected in management, and many natural resources cannot be properly treated and settled. Garbage mountains and rivers are often polluted. Due to insufficient management, loose system and the neglect of residents, there are big loopholes in rural environmental monitoring for a long time.

At present, our country rural economy overall level is still very low, slow economic development, population quality is poor, a lot of people don't realize the necessity of drainage pipe network, combined with insufficient government, make a lot of village is in a state of drainage pipe network system is not set, it makes life was relatively decentralized wastewater emissions, affect the overall effect of the activated sludge wastewater treatment life.(Kumar;Kumar, 2018) In addition, for the treatment of rural wastewater, regulation is an extremely important part. Due to the limitation of education level, the rural population has insufficient awareness of environmental protection. Due to the long-term lack of management in the treatment of rural domestic wastewater, the government departments cannot well adapt to the development of The Times, and the supervision on the treatment of domestic wastewater is far below the expected level (Liu et al. 2016).

2.2 Treatment of rural domestic wastewater based on activated sludge

2.2.1 Research progress of activated sludge process for wastewater treatment

Activated sludge is a macroscopic floc composed of a variety of living microbial groups in wastewater, which is called floc or zoolea. The main organism in the activated sludge is aerobic microorganism, which is dominated by bacteria. Meanwhile, there are yeast, mold, actinomycetes, protozoa and metazoan, etc., which together constitute a balanced ecosystem. Activated sludge has good sedimentation performance and can be used to treat rural domestic wastewater (Zhang et al. 2015).

The basic principle of activated sludge removal of pollutants in wastewater is: after the activated sludge mixed with good contact with water, because of the activated sludge has a larger specific surface area, surface mucous layer rapidly, a large amount of organic or inorganic pollutants adsorption process can be completed within 30 minutes, about more than 70% of COD in waste water can remove, at the same time, the adsorption of organic or inorganic pollutants in the role of microbial enzymes, decomposition or synthetic metabolism, hence leading to the purification of wastewater.

2.2.2 Activated sludge treatment of rural domestic wastewater

The molecular structure of organic compounds in rural wastewater is complex and stable, so it is not suitable for direct biochemical treatment. The original after removing particulate matter and drain the waste water into the iron carbon bed, with iron and carbon as the positive and negative of tiny battery, waste water as the electrolyte solution, make the waste water in the iron carbon oxidation - reduction reaction occurs in the bed, forcing chain cut off of the organic matter from large molecules into small molecules, thus improve the rural life of wastewater biological sex.

The sludge is the recirculating sludge from an aeration tank of a chemical plant, with a yellow-brown appearance and good sedimentation, and is the activated sludge with good properties (Zhou et al. 2017). Many

microorganisms in activated sludge have the ability to degrade inhibitors after a period of exposure, so the sludge needs to be domesticated. After the activated sludge was aerated for 24h, the supernatant was discarded, and then intermittent pressure culture and domestication were carried out. At the initial stage of acclimation, a small amount of pretreated wastewater was added and diluted with tap water. Nutrients were added in a ratio of BOD: N: P = 100:5:1. CODCr was controlled at about 800 mg /L and COD mass concentration was measured every two hours.

According to the above procedures, the treatment method of activated sludge of rural domestic wastewater based on ecological protection can be effectively realized.

3 Results

The treatment method of activated sludge of rural domestic wastewater based on ecological protection was adopted for experimental testing, and the following experimental results were obtained

The pretreated rural domestic wastewater was mixed in the reactor, and the CODCr was about 2,000 mg /L, the pressure was 0.1 mpa, the residence time was 10 h, and the aeration volume was 2.0 L /min. The effect of sludge mass concentration on the COD removal rate was investigated. The experimental results are shown in figure 1.

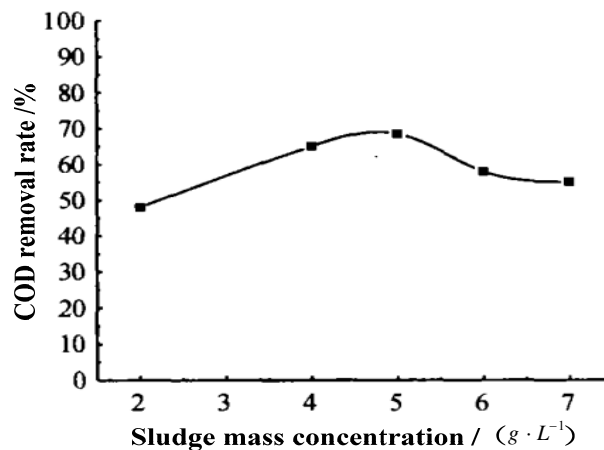


Fig. 1 Effect of sludge mass concentration on COD removal rate

There is a critical point for the influence of the mass concentration of activated sludge on the COD removal rate. Before the critical point, the COD removal rate increases with the increase of the mass concentration of activated sludge, and after the critical point, the COD removal rate decreases with the increase of the mass concentration of activated sludge. Microorganisms in activated sludge can purify organic pollutants in wastewater by adsorption, aggregation and oxidation decomposition under sufficient dissolved oxygen conditions. Therefore, the performance of activated sludge in the treatment of rural domestic wastewater is superior.

4 Conclusion

With the rapid development of economy, China's rural wastewater discharge and pollution load shows a rising trend. In order to protect the rural ecological environment, this paper proposes a method of activated sludge treatment of rural domestic wastewater based on ecological environmental protection. After the acclimation of activated sludge, the activated sludge was applied to the treatment of rural domestic wastewater, and the experimental results were obtained.

References

- Aratboni, F. A., Arzani, H., Javadi, S. A., & Farahpour, M. (2017). Gis Based Water Suitability Classification for Sheep - a Case Study of Savadkooh Watershed, Mazandaran, Iran. *Applied Ecology and Environmental Research* 15(3): 1149-1156.
- Chen BQ, Luo YJ (2017) The Characteristic of Public Cognition of Smog and Its Structural Constraints. *Journal of Huzhou Teachers College* 5(1):551-513.
- Jing W, Chang I S, Yilihamu Q, et al (2017) Study on the practice of public participation in environmental impact assessment by environmental non-governmental organizations in China. *Renewable & Sustainable Energy Reviews* 749(3):86-200.
- Kumar, R., Kumar, V. (2018). A Review of Phylogeography: Biotic and Abiotic Factors. *Geology, Ecology, and Landscapes* 2(4): 268-274.
- Liu N, Xu WY, Xiao Q, et al (2018) Study on the role of non - profit environmental organizations in prevention and control of smog from the perspective of environmental ethics. *Inner Mongolia Environmental Sciences* 3(4):256-258.
- Liu, J., Yang, L., & Zhao, C. (2019). The Purpose and Realization Mechanism of Ecological Resource Audit under the Background of Sustainable Development. *Ekoloji* 28: 3895-3900.
- Lühns N, Jager N W, Challies E, et al (2018) How Participatory Should Environmental Governance Be? Testing the Applicability of the Vroom-Yetton-Jago Model in Public Environmental Decision-Making. *Environmental Management* 61(2):249-262.
- Moon K, Blackman D, Brewer T D, et al (2017) Environmental governance for urgent and uncertain problems. *Biological Invasions* 19(3):785-797.
- Schoon M, York A, Sullivan A, et al (2017) The emergence of an environmental governance network: the case of the Arizona borderlands. *Regional Environmental Change* 17(3):1-13.
- Zhang Y, Wang M, Jin GH, et al (2017) Vulnerability Assessment of Urban Atmospheric Environment under Influence of Human Activities. *Journal of Jilin University (Science Edition)* 12(4):23-25.

