

# Review of Sludge Reduction Technology in the Wastewater Treatment Plant

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**Abstract:** Whether water treatment or sewage treatment, it is necessary to increase the analysis and implementation of sludge reduction technology. In the process of wastewater treatment, by adding enzymatic hydrolysis technology, mechanical disposal technology, processing technology, thermal decomposition, and other technical means, the gas in the cells will be released, and then the cells will be sent back to the activated sludge tank to further degrade the dissolution generated by cell rupture, resulting in the reduction of sewage. Sludge reduction technology further reduces the cost of sewage production and treatment through sludge anaerobic discharge, sewage distillation decomposition, sludge drying, sludge incineration, and other treatment processes. Based on this, through the selection and comparison of various sludge reduction technologies, clearly == analyzed the advantages and disadvantages of various technologies that can be used as a reference for other sewage sludge reduction.

**Keywords:** Sludge Reduction; Sludge Drying; Sludge Digestion; Sludge Incineration

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## Introduction

With the gradual improvement of the urban wastewater treatment rate and the reduction of the number of construction wastewater in our country, the gradual reduction of the sewage disposal problem has gradually appeared. Chinese sewage disposal started late. There is a "heavy water light mud" effect in wastewater. Sewage treatment methods are not perfect. The safe disposal of sewage is a weak link in the pollution control industry. Microbial disposal is the most common wastewater disposal method. This creates a large amount of residual sewage. Some sewage must be timely and accurate disposal, build reduced, harmless and comprehensive utilization to ensure the stable operation and disposal performance of wastewater, and avoid the secondary pollution caused by sewage.

## 1. Sources and properties of sludge in sewage treatment plants

The wastewater treatment process will cause a lot of deposition, including suspended matter, bacterial cells, particulate gas, etc. Sewage, because sewage production increases pollution and water stripping and cleanliness. The main channels caused by sludge are primary sludge soil from the primary sedimentation tank, which is the physical stripping of sinkable

solids. Secondary sewage is distilled sewage separated from water, which is the intermediate of bacteria habitat and nitrogen organic easily degradable gas accumulation. Physical sewage is caused by the dissolution of specific gases or suspended solids: oily sewage, air-floating scum, and activated sludge caused by crude oil and petrochemical industry wastewater. Oily sewage and floating air scum contain high-fat concentrations and viscosity and are difficult to dissolve, distill and decompose. The remaining activated sludge contains many odorous bacteria, which have good sink efficiency and is not easily taredistill and dehydrated. Sewage is also considered hazardous waste because it contains certain poisonous gases. It is necessary to carry out preliminary disposals, such as sewage distillation, discharge, and decomposition, which can significantly reduce the sludge quality.

## **2. Overview of sludge reduction in sewage treatment plants**

Wastewater reduction is the physical, physical, and bacterial means to increase the amount of sludge produced by wastewater. Wastewater reduction can be deployed in different wastewater disposal wheels. In the process of wastewater treatment, by changing the ceramic variable of the evil spirit system, measures are taken to increase a part of the transplanted sewage, which can be called in situ sewage reduction. For sewage outside the discharge system caused by the wastewater treatment process, sewage reduction can be made through sewage distillation, sludge digestion, decomposition, sludge drying, incineration, and other system equipment. This step is called post-disposal—wastewater reduction. Uncoupling metabolism refers to adding chlorobenzene and other substances in sewage to understand the coupling agent. Endogenous metabolism mainly refers to the decomposition of cells through a short aeration period or a large load of methane. Bacterial hunting mainly refers to the hunting and loss of solid sewage by bacteria. Sewage provides heat for bacterial decomposition to construct sewage reduction.

### **2.1 In situ sludge reduction**

In situ sludge reduction refers to increasing the amount of sludge produced during wastewater treatment rather than resulting sewage. Usually, the ceramic is the activated sludge caused by the sedimentation tank. Part of the activated sludge is returned to the activated sludge aeration tank to participate in the lousy chemical reaction again. The other part of the activated sludge is oxidized by further enzymatic hydrolysis, motor disposal, processing, thermal oxidation, DC disposal, and other methods. Quantification technology means breaking cells, releasing intracellular gas, and then returning to the activated sludge aeration tank, further oxidizing the cellular lysate caused by cell fracture to construct sewage reduction.

### **2.2 Sludge concentration**

Sewage distillation is an essential step after dehydrating sewage ions, reducing the concentration of sludge, sewage distillation, and reducing the volume of sludge—difficulty and cost of sludge disposal. The standard methods of sewage distillation include gravity concentration, air flotation, and centrifugal concentration. The gravity content mainly depends on the amount of water and sewage. The sludge settled to the bottom of the tank and discharged, and the concrete was separated from the upper part of the tank. Gravity distillation is a natural transmission and sinking step of sewage, which usually requires a short period, especially the poor distillation performance of low-viscosity sewage. In this regard, wastewater is often heated by sludge, which can speed up the dissolution steps and performance of sewage and build an exemplary structure of sewage and water. The commonly used gravity concentrator has a secondary sedimentation tank, sewage concentrator, and so on. For sewage near water, it is easy to construct a gravitational distillation, so the distillation of sewage can be expanded using an air float method.

## 2.3 Sludge digestion

The theory of sludge digestion mainly depends on aerobic or microbial excretion of endogenous metabolism. Endogenous metabolism mainly refers to when the public permeable cytoplasmic depletion is exhausted, a part of the cell is killed, and the solution of methane stored in the cell is used by living cells to maintain human effects. Aerobic digestion refers to converting sewage into methane and water through the endogenous metabolism of cells under the premise of aerobic to construct sludge reduction. Anaerobic excretion is under the premise of microorganisms, through the endogenous metabolism of cells to transform sewage into carbon dioxide, construction of sewage reduction. The regular use of microbial excretion is more commonly used. Anaerobic excretion has a rapid oxidation rate. Therefore, it is necessary to properly improve the initial decomposition degree of sewage and accelerate the chemical reaction thread. It is necessary to establish a proper pretreatment process after microbial excretion to eliminate this problem. Anaerobic discharge can increase the amount of residual sludge and cause biomass destruction heat, which has a particular benefit. The pretreatment process improves the decomposition rate of sewage and the reduction of sewage and biomass.

## 2.4 Sludge dewatering

After the effluent is discharged by distillation, dehydration is carried out by infiltration and melting. Depending on the characteristics of the sewage, after one to several weeks of natural moisture, the water content of the sewage can be reduced to 70%. The natural drying method has low energy consumption, but it is restricted by the problems such as small areas, small air pollution, and the significant influence of drought conditions. Most motor decomposition methods are currently used, such as plasma filtration dehydration, pressure filtration decomposition, and centrifugal decomposition. Motor decomposition requires the pre-disposal of sewage after decomposition. There are many ways of post-treatment, of which the most commonly used is antibiotic cooking. Adding cooking refers to adding chemicals to sewage, changing the structure of sewage particles, reducing the attraction of sewage and water, and improving the decomposition efficiency of sewage. The motor dewatering method covers a large area; the decomposition performance is stable and can be constructed after production maintenance. In specific production, sewage distillation is often integrated with motor decomposition, significantly improving the performance of sewage decomposition and reducing the difficulty of sewage disposal.

## 2.5 Sludge drying

The waste water's water content after the motor's decomposition is usually 60%~85%. Therefore, it is necessary to properly dry the decomposed sewage to reduce the total mass of sewage. Or sludge burning to lay the foundation. The different heat mediums can be divided into turbine sludge drying method, hot water drying formula, steam drying method, photovoltaic drying method, crude oil drying method, flue gas waste heat sludge drying channel, and so on. The steam drying method is widely used in concrete production. The steam drying method uses steam as natural gas to melt the water in sewage, reduce the concentration of sewage and achieve the goal of increasing sewage. Below is the comparison and selection of several different sludge drying technologies analyzed in the report. Different sludge drying technologies have different characteristics, but the common problem is that the smell caused by the site and the odor need to be removed.

## 2.6 Sludge incineration

Sludge incineration burns sewage at low temperatures to remove water and methane from the sludge. After the fire was set, the wastewater was turned into ruins, and components such as bromine and hydrogen were transformed into various final products. The invention not only dramatically reduces the size and quality of the sewage but also kills all the serious disease pathogens so that the sewage is no longer equipped with water pollution skills. It establishes the harmless disposal of sewage.

Residence time, ignition concentration, oxygen content, the water content of sewage, and heat value of sludge are the main control factors of sludge incineration but have little influence on sludge incineration.

## Conclusion

In short, sewage disposal is a vital link to ensure the excellent operation of wastewater. The industry's ultimate goal is to increase sludge production and make sludge stable, harmful, and comprehensive utilization rate. But our country lacks harmless comprehensive through the final processing way. It was found that the method of sewage agricultural and sludge composting has not been promoted in our country due to the low vegetation compaction and feed transmission rate. It is the primary sewage treatment method in China. The method is sewage landfill. With the decrease in sewage production, the problem of landfill becomes more and more noticeable. Most cities and towns have faced the embarrassment of landfills, resulting in sewage disposal. Depending on the heat value of the sewage, arson can be set individually or jointly. However, there are still some drawbacks in sludge incineration, which need to be proved repeatedly and through further analysis and exploration.

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