Research on sewage treatment based on the Automation system

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Abstract. With the rapid development of the social economy in China, although people's living standards have improved, the problem of environmental pollution is becoming more and more serious, especially the pollution of water resources. A large amount of sewage is often discharged in life and production, which will pollute the underground, lakes, rivers and other water resources, and then affect people's normal life and life safety. However, the efficiency of the sewage treatment system at this stage is relatively low, which is difficult to meet the needs of today's social development. In this case, to improve the effect of sewage treatment, it is necessary to use electrical control automation and make scientific and rational use of the advantages of electrical control automation to fundamentally improve the efficiency of sewage treatment. This paper focuses on the electrical control automation of the sewage treatment system and shows some new intelligent control technologies.

Key words: Sewage treatment system; Electrical control; Automation; Intelligent control.

1. Introduction

Due to the wide scope of industrial sewage treatment, it can be said that it contains various types of industrial production wastewater and sewage, which has many harmful components and has a great impact on the natural and human living environment. At the present stage of the steady and rapid economic development of our country, the added value of industrial production increases year by year, the scale of industrial production continues to expand, and the discharge of industrial wastewater and sewage increases year by year if this sewage cannot be controlled scientifically and effectively. Ensuring the effect and efficiency of sewage treatment is likely to hurt the sustainable and healthy development of China's industrial production in the future. in the end, we may face the situation that there is no water to drink in human life, there is no water in industrial production, and nature is wantonly destroyed. Therefore, strengthening the research, development, and application of industrial sewage automatic monitoring and treatment technology is of great significance to improve the current automation level of industrial sewage treatment, especially to improve the effect and quality of industrial sewage treatment. [1,2]
2. Sewage treatment process

2.1. Pretreatment
The sewage treatment process is usually complicated because the sewage comes from many places, and the sewage roughly includes domestic sewage and industrial production sewage. When the type of sewage is different, the pollutants it contains will be different, and there will be some differences in the methods used in the process of treating and purifying these pollutants. Therefore, in the initial stage of sewage treatment, these pollutants must be pretreated first. Simply remove the easily separated pollutants, for example, when there are large floating substances in the sewage, if you want to deal with these pollutants, you need to use professional equipment (lift pump, etc.) to transfer these pollutants to the sedimentation tank for precipitation treatment, and remove the suspension and impurities such as SS and CODcr in the sedimentation tank. At the same time, it is also necessary to simply disinfect the sewage in the sedimentation tank, and then transport the treated sewage to the next treatment unit for further treatment. [3]

2.2. Deep treatment
Advanced treatment is a very important link in the whole sewage treatment process. The so-called advanced treatment is to further improve the water quality of the simply treated and filtered sewage and remove harmful substances and ions from the sewage. So that it can be used again. During advanced treatment, the water that has been pretreated is transferred to the original pool and then depends on the multi-media filter to precipitate and remove the smaller particles and colloids in the water to improve the water quality. Subsequently, other impurities in the water can be removed by adding disinfectants, reducing agents and scale inhibitors, and the deeply treated water can be recycled again. After advanced treatment, the water will contain more pollutants and different chemicals, and the relevant staff can continue to further treat these ingredients. Through simple blending and treatment, users who need low water quality can use this part of the water again.

3. Electrical control automation of sewage treatment system

3.1. Requirements of a sewage treatment system for electrical control automation system
In recent years, people from all walks of life and relevant departments have attached great importance to the problem of environmental treatment, especially the treatment of sewage. With the promotion of science and technology, China's information technology and automation technology have also made rapid development. Sewage treatment is also gradually moving towards the direction of intelligence and automation. At this stage, the types and brands of sewage treatment systems and sewage treatment devices on the market are also increasing. A variety of advanced sewage treatment devices and treatment systems are also widely used at present. To some extent, this not only improves the degree of automation of sewage treatment but also significantly improves the efficiency and quality of sewage treatment. The electrical control automation system can automatically control the sewage treatment system, and when using the system, it must be able to adapt to bad operating conditions, because in the process of using the system to treat sewage, sewage usually contains a large number of harmful substances and pollutants, the pH and ion content of these substances are abnormal, which is likely to lead to the normal operation of the imaging system. Also, the electrical control automation system must be able to record the changes in the sewage treatment process in real-time and sensitively, and help the responsible personnel to analyze the status and effect of sewage treatment: during the operation of the electrical control automation system, relevant staff should also pay attention to sewage treatment information and data collection, and record water temperature, water level, acidity and alkalinity, and other sewage treatment parameters. [4]
3.2. Composition of the electrical control automation system

The sewage treatment system is a combination of multiple hardware equipment. In the whole sewage treatment system, the monitoring system and the control system are its important parts. The function of the monitoring system is to display the running process of each machine and the relevant parameters of the running state in the monitoring system through the controller during the operation of the equipment, and the function of the control system is to control the sewage treatment process. Through the upper, middle and lower three-level sewage treatment control methods to treat sewage, and control the corresponding hardware equipment and supporting facilities of the sewage treatment system to ensure its efficient and safe operation. The electrical control system of the sewage treatment system is mainly composed of the following parts: [5]

1. Get on the plane. It can display the dynamic changes of waterways and gas channels after sewage treatment and can use computer programs to monitor the dynamic information of motors and valves in real-time. In the process of use, if the electrical automatic control system fails, the upper computer can accurately find the fault location and deal with the fault automatically.

2. Median machine. It can logically control the automatic control system. As the main part of the electrical control system, the median computer can not only transmit the data information of the upper and lower positions in real-time but also detect and process the data.

3. The lower machine. The main component of the lower computer is the intelligent instrument, which is the most independent structure in the system. In the process of sewage treatment, the lower position can not only collect information but also ensure the storage of information, and ensure that it is not affected by external factors. The above three machine positions all play a very important role, and the use of hierarchical control can effectively avoid the failure of one machine position during the operation of the system and affect the operation of other machine positions.

3.3. Parameter measurement control

1. Liquid level. When the area of the sewage tank is relatively small, the hydrostatic pressure sensor level meter should be used for measurement, and the diffused silicon sensor can be used to measure the liquid level transmitter. When the sewage tank is large, the ultrasonic level meter can be used. There is a difference between the two measurement methods. In a small sewage tank, the static pressure of the liquid is transferred to the soundproof pipe, which then transmits the information to the sensor, which converts the pressure into an electrical signal and then passes it to the controller. In large sewage, when the ultrasonic wave is in contact with the liquid surface, the ultrasonic signal can be sent to the sensor and controller according to the echo principle.

2. PH value. The potential method can be used to detect the PH value of sewage. In general, the output signal value of the PH sensor is very small and needs to be magnified before it can be transmitted to the automatic controller.

3. Temperature. Temperature measurement usually uses platinum thermal resistance as a sensor because of its high sensitivity and can directly convert the temperature signal into a voltage signal, which can be transmitted to the automatic controller by amplification.

4. Dissolved oxygen. Special attention should be paid to the measurement and control of dissolved oxygen in sewage. A dissolved oxygen allocation plan can be established in the aeration tank to ensure the scientific nature of sewage treatment.

4. The development of automatic and intelligent monitoring and treatment technology of industrial sewage

The advanced stage of the development of automatic control is "intelligent", which integrates multi-disciplinary knowledge such as artificial intelligence, cybernetics, system theory, and information theory. Today, intelligent technology can be divided into three main branches: fuzzy control, neural network control and "integrated intelligent control" including two or more intelligent control technologies. In the process of practical application, "integrated intelligent control" is usually combined with traditional control technology as far as possible to improve the application effect, so its application
range is the widest. The reason why the intelligent control system is easy to be accepted and applied by most people is mainly due to its functional characteristics of self-learning, self-adaptation, and self-organization, especially in complex industrial control systems. For example, the control of the dynamic process of industrial sewage treatment has become the focus of the research and application of industrial sewage automatic monitoring and treatment technology in recent years. [6]

4.1. Fuzzy control technology

The so-called "fuzzy control" means that prior operators and relevant experts first convert the existing control experience and knowledge expression into control rules described by language variables, and then "implant" these control rules into the control system. Let the control system run according to this rule. Because of the complexity and fuzziness of "control experience" and "knowledge representation", the realization of fuzzy control needs the help of the unknown and complex nonlinear mathematical model system. In the 1980s, foreign experts and scholars tried to apply fuzzy control to the process of industrial sewage treatment, mainly taking the monitoring data of effluent BOD, SS, DO, aeration tank MLSS, effluent ammonia-nitrogen concentration and reflux sludge as input variables of the fuzzy control system to match the "rule set" designed in advance after the system was "fuzzified". Then according to the matching situation to make the corresponding control means to adjust and control the sewage treatment process and the indicators involved.

4.2. Neural Network Control Technology

"Neural network" refers to the network formed by connecting a large number of artificially designed neurons, which has the characteristics of self-adaptability and fault tolerance, nonlinear mapping ability and strong learning ability. Given the above characteristics of the neural network, sewage treatment experts at home and abroad pay more and more attention to try to apply artificial neural network control technology in the automatic monitoring and treatment system of sewage treatment, and valuable results have been achieved. For example, in the sewage treatment monitoring system including ORP, pH, DO and other on-line sensors, the artificial neural network algorithm is used to deal with the relevant data, mainly to classify the sampling data of signal points such as vertex, inflection point, step and so on, and then save the record in the form of appropriate XML, which is used as the basis to measure the signal change trend and important events in the sewage treatment process. The classification and identification of monitoring signals based on artificial neural network algorithms are helpful to select the appropriate "supervisory learning training set" and ensure that the industrial sewage automatic monitoring and treatment system has a good "learning" effect. [7]

4.3. Integrated Intelligent Control Technology

The so-called "integrated intelligent control" is mainly the combination of two or more intelligent control technologies, the purpose is to overcome the shortcomings of single intelligent control technology, to give full play to their respective technical advantages and ensure the overall control effect. The integrated intelligent control mode has been widely studied by researchers at home and abroad, and some achievements have been achieved. For example, with the combination of artificial neural network control technology and other control calculation, based on the industrial process of anaerobic sewage treatment with unstable water quality, a fuzzy adaptive reasoning technology (ANFIS) is designed, which can use all the effective data on-line and off-line as input to predict the effluent COD. The experimental results show that the prediction effect of this method is good.

5. Conclusion

To solve the problem of water pollution at the present stage, our country has established a special sewage treatment system, which can carry out pretreatment and advanced treatment of sewage, which will effectively reduce the content of pollutants in sewage and reduce the harm of sewage. It has played a very important role in the treatment of water pollution in our country. The level of electrical control automation of the sewage treatment system will directly affect the operation efficiency and performance...
of the sewage treatment system. Secondly, the only treatment model is becoming more and more important. Therefore, the relevant technical personnel must be proficient in and be able to use the electrical control automation technology, and the relevant researchers should constantly optimize the electrical control system to improve its operating efficiency and performance, to ensure the effect of sewage treatment.

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