

Shallow of urban industrial sewage treatment plant environmental impact assessment

-- Taking an industrial clusters in Nanchong sewage treatment plant as an example

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Abstract

In nanchong jialing industrial clusters sewage treatment plant as an example, through the selection of sewage treatment plant site, processing technology and so on carries on the detailed introduction, and combined with the engineering characteristics and the experience of environmental impact assessment, the industrial sewage treatment plant should focus on site selection and the position of the tail water drains, risk assessment, the sewage treatment plan optimization problems, and puts forward corresponding measures and Suggestions, for the operation of sewage treatment plant to reduce negative environmental impact.

Keywords

Sewage treatment plant; Tail water discharge; Risk assessment; Environmental impact assessment

1. Introduction

In order to develop economy and shorten its gap to national average level, Nanchong in Sichuan Province built several large-scale industrial parks successively. Considering that the rapid progress of industrialization forced huge pressure on underground water environment, each industrial park constructs its own sewage treatment plant. By taking the sewage treatment plant in Jialing industrial concentration district as example, the environmental influence analysis is implemented from multiple aspects.

Located in Nanchong, Sichuan Province and the west coast of Jialing River, Jialing industrial concentration district has no sewage water treatment plant at present, so the industrial and domestic wastewater receives advanced treatment by Nanchong sewage treatment plant after being pre-treated (partially) by enterprises. Meanwhile, the sewage pipe network in this district mainly is combined pipelines with low reject rate; that is to say, some sewage in combined system is discharged into natural water together with rainwater, which leads to obvious pollution zone in discharge outlet so that, the water is black and smelly with mosquitoes, and the pollutants in water exceed its environmental capacity. Since there is no sewage treatment plant in Jialing industrial concentration district now, some sewage is discharged directly after collection, which threatens the drinking water security there.

For the sake of protecting water environmental quality as well as ecological security of Jialing River and improve industrial environment, it is planned to construct a sewage treatment plant in capacity of

15,000 ton/day. In addition, combining with the overall planning and water supply and drainage specialized planning of Jialing industrial concentration district, to realize the harmonious development of industry and environment. From the environmental protection perspective, the treatment technology, pipeline network design, tail water discharge and sludge disposal are argued, which received recognition from municipal environmental protection agency as well as experts, and are adopted in construction implementation.

2. Engineering Analysis

2.1 Site Selection

The site selection of sewage treatment plan directly determines its running cost and influence on environment. For this reason, the environmental influence evaluation of sewage treatment plan must carry out rational risk evaluation. The site selection of sewage treatment plan shall follow these principles: ① site selection shall meet general city planning and drainage project specialized planning; ② locate downstream cities and towns so that sewage flows into sewage treatment plant by itself; ③ locate downwind the minimum wind direction frequency of cities and towns in summer; ④ excellent engineering geological conditions; ⑤ keep certain width of sanitary protection zone with urban planning residence and public facilities; ⑥ consider possibility of long-term development and extension; ⑦ trunk sewer shall be as short as possible to give convenience to the discharge and utilization of sewage as well as sludge; ⑧ plant terrain will not in water logging and accords with flood control standard; ⑨ equipped with convenient transportation, water and electricity conditions; ⑩ make the most of terrain and select regions with proper gradient to meet elevation arrangement of sewage treatment structures and then reduce work amount of cubic meter of stone. According to principle and site solution to be built, see Table 1 for feasibility analysis of sewage treatment plant in Jialing industrial concentration district.

Table.1 Feasibility analysis of sewage treatment plant in Jialing industrial concentration district

No.	Principle of sewage treatment plant site selection	Introduction of project	Whether qualified
1	The site selection shall meet general city planning and drainage project specialized planning	Accord with Nanchong Jialing industrial concentration district water supply and drainage project specialized planning	Qualified
2	Locate downstream cities and towns so that sewage flows into sewage treatment plant by itself	play pipeline network along the terrain so as to discharge into trunk main and main pipeline	Qualified
3	Locate downwind the minimum wind direction frequency of cities and towns in summer	The wind direction in project region is north and northwest	Qualified
4	Excellent engineering geological conditions	No bad geological phenomenon such as landslide, fault or karst cave	Qualified
5	Keep certain width of sanitary protection zone with urban planning residence and public facilities	Away from population compact district with less influence on the environment of Jialing industrial concentration district	Qualified
6	Consider possibility of long-term development and extension	Flat surrounding terrain, which is convenient for extension in second stage	Qualified
7	trunk sewer shall be as short as possible to give convenience to the discharge and utilization of sewage as well as sludge	Nearby industrial park, which is close to sewage discharge points and convenient for concentrated disposal and drainage	Qualified
8	Plant terrain will not in water logging and accords with flood control standard	Flat terrain, within natural elevation	Qualified
9	Equipped with convenient transportation, water and electricity conditions	Nearby industrial park with perfect infrastructures and guaranteed water as well as electricity supply	Qualified
10	Make the most of terrain and select regions with proper gradient to meet elevation arrangement of sewage treatment structures and then reduce work amount of cubic meter of stone		Qualified

To sum up, as analyzed from environmental protection perspective, the site selection of sewage treatment plant in this project is basically reasonable.

2.2 Sewage Treatment Process

According to the characteristics of sewage from various industries in the concentration district, the specific survey and argument are carried out. Meanwhile, combining with the practical operation situation of sewage treatment plants in the same category (Jiangxi Nancheng Industrial Park sewage treatment plant, Jiangsu Suzhou Industrial Concentration District sewage treatment plant, Jiangsu Suqian Industrial Park sewage treatment plant, Huaian Economic and Technological Development Zone sewage treatment plant, and Nantong Development Zone secondary sewage treatment plant), the advancement of treatment methods is compared to determine “hydrolysis+ A2/O+ coagulating sedimentation+ MBR film+ ozone” as sewage treatment solution in concentration district, which can guarantee the major pollutant in discharged water meet Environmental Quality Standards for Surface Water (GB3838-2002) Class IV water requirement.

According to the characteristic of wastewater quality, the key pollutants in sewage are organic pollutant, ammonia nitrogen and phosphate, so the sewage treatment degree in this project is higher. Firstly, the “grating+ regulating reservoir (accident pool)+ aeration grit basin+ hydrolytic acidification” is adopted in pre-treatment stage to degrade pollutants, enhance biodegradability of wastewater and give convenience to subsequent aerobic treatment. The secondary biological treatment process applies A/A/O technology with higher automation level, convenient maintenance and better discharged water [1]. Latter, the deep processing of “coagulating sedimentation” can further remove phosphorus, suspended solid and BOD₅; and the phosphoric removal rate in this step reaches to 90~95%.

After that, MBR film is used for filtration, where the pressure difference at both sides of film is driving force and film is filtering medium, so that in certain pressure when original liquid flows over film surface, the micropores in film surface will only allow water and micro-molecule articles to pass by and form permeate liquid, while the substances larger than diameter of micropores in film surface are intercepted in film liquid inlet with turning into concentrated solution, when the separation and concentration of original liquid are achieved. Finally, ozone is applied for disinfection treatment; considering its strong oxidizing property, ozone can process the organic matters that are difficult for biodegradation, such as most HC organic matters, phenol and cyanide, and the matters causing chromaticity and foul smell. Meanwhile, the chromaticity of industrial wastewater, which is degree 10 on average and reaches to degree 20 in maximum, so general coagulation sedimentation or sand leach cannot fully remove, which may even exceed the worst standard. On the contrary, ozone treatment will reduce chromaticity below degree 1 with characteristics of rapid reaction, easy for preparation, simple flow and no secondary pollution.

2.3 Sludge Treatment System

Aimed at the characteristics of sewage treatment plant, the sludge is mainly generated from secondary sedimentation tank and coagulation sedimentation tank. There are two methods without needing of digestion, one is gravity concentration while mechanical dehydration; another is mechanical concentration and dehydration. Jialing industrial concentration district adopts the following solution to process sludge: sludge → sludge tank → concentration by centrifuging filter pressing dehydrator → outward transportation device. The sludge in tank enters into sludge storage tank directly, which is then transferred to tempering tank through sludge screw pump, sludge character is regulated by adding flocculating agent, after that, sludge enters into centrifuged sludge dewatering facility with reducing moisture content to 80% [4].

The mud cake produced by dehydrator is transported outside sewage treatment area, and all the mud generated are received by refuse landfill in near future and transported to Nanchong sludge treatment center in long time, which will not generate great influence on environment.

2.4 Reuse Of Recycled Water

To industrial park, to supply the purified urban sewage to the multi-target and multi-object recycling of industrial enterprises as well as municipal administrative units is feasible in technology and appropriate in economy, which is vital to save water resource and facilitate sustainable development. The discharge load of tail water in sewage treatment plant is high every day, so reuse of recycled water can make the most of water resource and save cost.

In near future, it is suggested to merely consider in-plant recycled water system, the demand of water in this project is about 30~40m³/h. In the long term, it is suggested to construct reuse of recycled water system to supply enterprises in industrial park. However, it is also necessary to argue the water quality of reuse of recycled water system, and emphatically analyze whether the various ions in reuse of recycled water system meets water quality standard [6].

2.5 Tail Water Discharge

The site planned to build Nanchong Jialing industrial concentration district is aside Nixi River; after meeting Environmental Quality Standards for Surface Water (GB3838-2002) Class IV water requirement, the purified water is discharged into Jialing River through Nixi River belt wetland+Nanhu wetland + Fengya belt wetland. These three complete ecological wetland systems achieve 240,000 square meters of effective water purification area, which can realize the effect of water storage and reservoir without threatening the water quality upstream and downstream draining outlet, or influencing downstream drinking water conservation district as well as water quality in Jialing River.

In conclusion, the draining outlet of sewage treatment plant in Jialing industrial concentration district is basically reasonable, which will not greatly influence environment.

3. Conclusion

- (1) With respect to industrial sewage treatment plant, it is required to combine with characteristic of industrial sewage water quality, emphatically focus on rationality of site selection, comprehensiveness of treatment process, reliability of reuse of recycled water as well as sludge disposal, and issue of tail water discharge; meanwhile, it is needed to propose corresponding countermeasures and suggestions by starting with exerting engineering effect and protecting environment, so as to better guide design and embody the value of environmental influencing evaluation [6].
- (2) As a kind of public work and environmental protection engineering, urban sewage treatment plant shall analyze and predict reasonably via environmental influence evaluation; adopt appropriate environmental protection measures by combining with regional engineering geology and hydrogeology conditions to lower adverse effect of emergency situation, prevent potential environmental risk due to secondary pollution, and authentically exert the function of improving urban environment.

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