

Recycling Improvement Assessment of Wastewater Treatment Process

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1. Background, Purpose, and Approach

Since current wastewater treatment procedures in power plants are mainly based on discharge after treatment, in the face of increasingly stringent environmental regulations and greater emphasis on in-plant water recovery rates, it is necessary to evaluate the feasibility of plant-wide wastewater recycling.

This project conducted relevant tests and evaluations on the treatment and recycling of combined wastewater and flue gas desulfurization (FGD) wastewater to propose feasible process improvement plans, methods for recycled water usage, and zero-discharge verification.

Combining previous research with this project's results confirms that recycled combined wastewater can be used as an alternative to raw water. This project also tested degassing membrane ammonia nitrogen wastewater treatment technology, which can be used in existing wastewater plants to reduce the risk of ammonia nitrogen exceeding standards in combined wastewater and FGD wastewater.

2. Results and Applications

This project confirms the impact of replacing raw water with recycled wastewater on the flushing frequency and chloride ion equilibrium concentration of the FGD

absorption tower. Furthermore, it completes the FGD wastewater zero-discharge program test, which can serve as a reference for future power plants to improve overall wastewater recycling applications.

Regarding the recycling methods for the combined wastewater, this project utilizes a series-connected membrane system to confirm operating parameters and water production efficiency, enabling the direct production of recycled water for reuse. On the other hand, considering the characteristics of the combined wastewater, it can also be fed directly into the FGD absorption tower as makeup water, except under special circumstances. Actual testing on Unit 1 showed that this approach had little impact on the chloride ion concentration within the tower, demonstrating its feasibility as a recycling solution.

This project also verifies the feasibility and treatment procedures for the zero-discharge of FGD wastewater. The crystalline salt obtained from this treatment process is primarily sodium chloride with a purity of over 80%; the remaining components are sodium nitrate, sodium borate, and a small amount of sulfate, which can serve as a reference for future improvements to the power plant.



Source: Photographed during this project

Figure 1. Jar test



Source: Photographed during this project

Figure 2. Evaporation test