

The Research on Improving Wastewater Recovery Rate

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1. Abstract

The Tatan Thermal Power Plant's environmental impact assessment (EIA) pledged a plant-wide wastewater recovery rate exceeding 70%, primarily from boiler blowdown wastewater during the production process. With the recent rise in environmental awareness and the perceived clean energy status of natural gas, which has become a baseload for power plants, boiler blowdown water usage has decreased annually, making it increasingly difficult to achieve the promised wastewater recovery rate. Therefore, Taipower is investigating the feasibility of enhancing comprehensive wastewater recovery to raise the overall wastewater recovery rate and ultimately meet its EIA commitment.

Initially, laboratory flask tests will be conducted with existing on-site chemical reagents. Future field designs will allow the existing chemical coagulation unit to be used directly, simply by adjusting the dosing parameters, eliminating the cost of adding a unit. Initial plans call for recycling tests directly with raw wastewater, using a chemical coagulation process as a pretreatment technology for the reverse osmosis unit. Coagulants will be used to reduce contaminants in the water and ensure that the water quality meets the membrane inlet requirements.

2. Results

In traditional chemical dosing procedures, to ensure smooth sedimentation of the downstream sludge, a coagulant is generally added before the downstream sedimentation tank. This allows the previously formed colloid plume to expand further and connect, resulting in

crystallization or the formation of a precipitate. The sludge then enters the sedimentation tank for solid-liquid separation, separating the sludge from the water sample in the wastewater, thereby achieving the goal of removing pollutants from the water.



Source: Photographed during this project

Figure 1. Real view of the pilot test



Source: Photographed during this project

Figure 2. Water intake location

Considering investment costs and benefits, since reverse osmosis treatment produces concentrated water discharge, to reduce additional downstream operating costs, the membrane unit's operating goal is to achieve maximum pure water recovery while ensuring that the

discharged concentrated water meets regulatory standards for effluent. This avoids the need for additional treatment units specifically for the concentrated water, which would increase system complexity. When the concentrated water directly meets effluent regulatory standards, the recovery system can reduce overall construction and operating costs and further increase system stability.

This project will utilize existing testing equipment, located adjacent to the on-site wastewater treatment

process, to directly introduce comprehensive wastewater for actual testing and verification. Laboratory flask tests will initially identify chemical coagulant parameters to confirm dosing parameters that maximize hardness removal. Validation will then be conducted using prototype plant equipment to determine optimal conditions for the actual plant, serving as a reference for future plant design.