

The introduction of wastewater reclamation in Taiwan

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Introduction

Although annual rainfall of Taiwan is 2.5 times of global average, because of uneven distribution of rainfall in time and space the per capita rainfall of Taiwan is only one seventh of global average. Besides, according to the evaluations of International Water Association, annual rainfall in Taiwan has drop 0.9% and drought period also decreased from 17 years to 9 to 10 years due to climate changes. It is estimated that the ratio between the increase of rainfall in raining season and the decrease of rainfall in drought season will reach 5-10% by 2050. The huge disparity between the rich and the poor and the extreme conditions have caused great difficulties in the management of water resources. Because the geography of Taiwan is steep and rivers flow very fast, the island has to retain water by reservoirs. The natural disaster causes the sediment accumulation in reservoirs to reduce the effective storage capacity of reservoirs year by year. With the rise of environmental protection, it is difficult to build reservoirs. Traditional water sources such as traditional groundwater, river water, and reservoirs have gradually encountered bottlenecks.

The effluent of the public waste water treatment has stable quality and quantity and is not effected by hydraulic and weather conditions. So, to the countries suffered by water shortage problem, treated water has become an alternative of water resources. Taiwan has 61 public waste water treatment plants under operating now, total capacity is about 4.03 million cubic meters per day. These effluent has become the solution to solve Taiwan water shortage problem.

Strategy

1. Industries with high output value have priority to use reclaimed water

Considering the risk, cost-effectiveness, popular acceptance of using reclaimed water, under the premise of not in contact with human body, the reclaimed water is provided to the industries with high output vale.

2. Waste water reclamation plant and water pipeline are regarded as water resource infrastructure

Because the price of reclaimed water is much higher than the price of tap water in Taiwan, using reclaimed water has no economic incentives. To reduce the price of reclaimed water, government will cover the expenditure of the construction of reclamation plant and water pipeline and reclaimed water user only has to pay the operating and maintenance cost.

3. Combine sewage system and water reclamation system

To avoid the interface between water reclamation plant and waste water treatment plant, two plants will be run by the same contractor

Selection of demonstration plants

According to the strategy mentioned above, the criteria for select demonstration plant are listed as follows

1. Water shortage area is preferred

According to the evaluations from Water Resource Administration of Taiwan, the gap between demand and supply

of water is about 1.5 million cubic meters a day in 2031. Water supply of some areas in Taiwan including Keelung, Taoyuan, Hsinchu, Miaoli, Taichung, Changhua, Chiayi, Tainan, Kaohsiung and Pingtung will have deficit at that time. Among these areas, Taichung, Tainan and Kaohsiung have high potential of water shortage compared to other areas. In 2031, the deficit of everyday water supply in Taichung will be about 338 thousand cubic meters, in Tainan will be about 284 thousand cubic meters and in Kaohsiung will be about 359 thousand cubic meters (Fig. 1). Due to the traditional water resources are limited, part of these shortages have to be compensated by reclaimed wastewater.

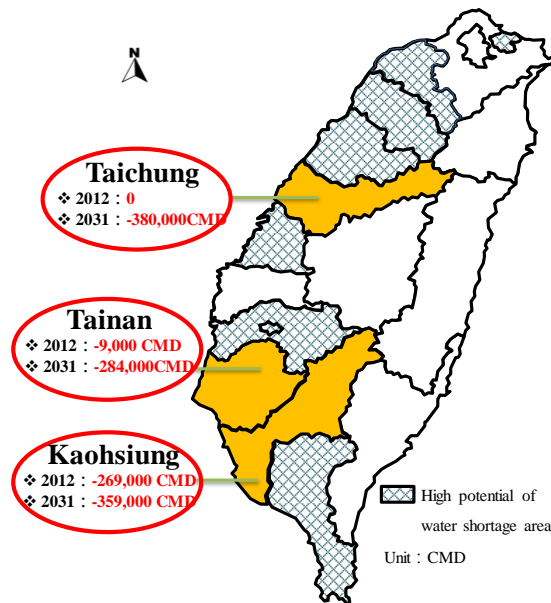


Fig.1 Potential of water shortage in Taiwan

2. Reclaimed water supply and demand can be matched

The quantity of reclaimed water supply is determined by the waste water treatment plant capacity and the quantity of water demand is based on water utilization plan approved by Water Resource Administration. Those with large demand and high industrial output value have lower tolerance to water shortage and have better promotion conditions

3. Low energy consumption and short conveyor distance

The distance and the level difference between demand side and supply side will decide the energy consumption and the will reflect the cost of construction.

4. The one which has willing to use water is preferred

Following above criteria, six plants shown in Fig.2 are selected to be demonstration plants. They are (1) Putian plant, in Taichung City, will send 130 thousand cubic meter reclaimed water per day to Taichung Harbor Industry Park (2) Anping plant, in Tainan City, will send 60 thousand cubic meters reclaimed to Southern Taiwan Science Industry park (3) Fengshanshi plant, in Kaohsiung City, will send 45 thousand cubic meters reclaimed water to Linhei Industry Park. The three plants are waste water treatment plant and will be transformed into waste water reclamation

plant. The fourth plant is Linhei plant, in Kaohsiung City, which will send 10 thousand cubic meters reclaimed water will to Linhei Industry Park. The fifth plant is Fengyuan plant, in Taichung City, which will send 20 thousand cubic meters reclaimed water to Taichung Harbor Industry Park. The sixth plant is Yongkang, in Tainan City, which will send 15 thousand cubic meters reclaimed water to Southern Taiwan Science Industry park. The fourth, fifth and sixth plants are still under construction. They will combine waste water treatment process and water reclamation process together. The project is expected to be finished in 2020 and total investment will reach 50 million US dollars

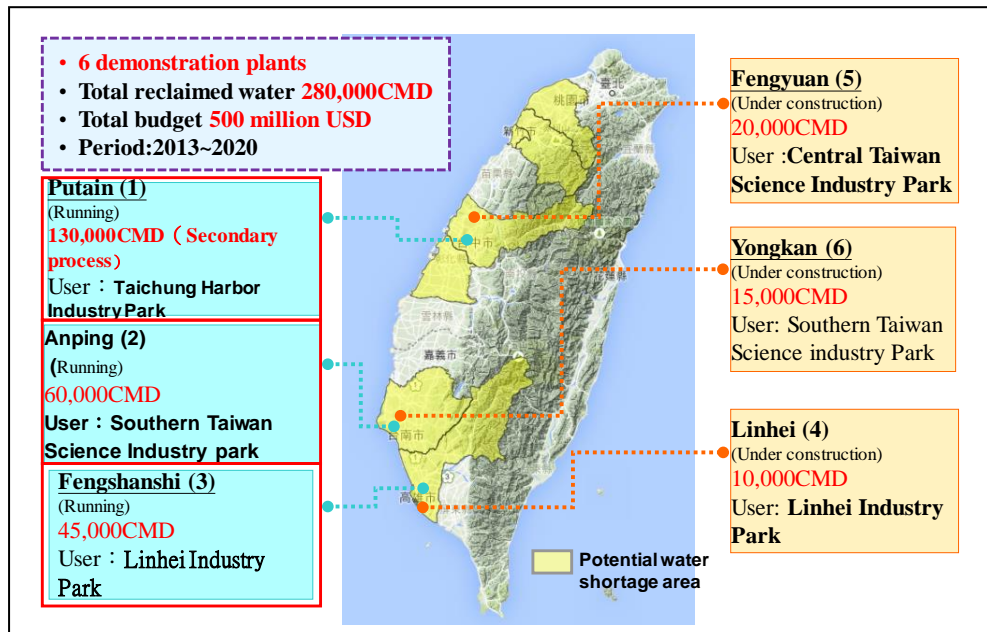


Fig.2 6 demonstration plants in Taiwan

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