How SANI cleaned up awards

Chen Guanghao

IN OUR PREVIOUS column, we discussed how we can make use of seawater to save our precious store of freshwater, minimize energy consumption and recover valuable fertilizer from our urine.

This week, we will discuss how seawater can help us to treat our sewage.

Every day, each of us produces 300 liters of sewage. Overall, we produce two million cubic meters of sewage a day in Hong Kong.

This can fill up Tai Tam Reservoir in less than 24 hours. Sewage treatment is not only expensive, but also produces a large amount of sludge requiring special disposal.

Conventional biological sewage treatment processes make use of microbes to digest and degrade sewage organic pollutants.

Since microbes grow rapidly, only about 40 to 60 percent of the organic materials will be converted into carbon dioxide and released into the atmosphere.

The remaining organic matter will be converted into biomass. The excess biomass will have to be disposed of as sewage sludge. In general, about 0.8 kilograms of sludge will be produced per cubic meter of sewage treated.

To treat all sewage generated in Hong Kong, about 2,000 tonnes of sludge is produced every day. Sludge disposal is costly, odorous and energy intensive. At the moment, it is being dumped in landfills. In future, it will be burned in a sludge incinerator.

Is there any way to avoid sludge production?

Every liter of seawater contains about 2.7 grams of sulfate.

By making use of the sulfate in seawater, we recently invented an environmentally friendly technology – known as the Sulphate reduction, Autotrophic denitrification and Nitrification Integrated process – which can minimize sewage sludge production.

The SANI process makes use of common microbes called sulfate-reducing bacteria to oxidize and eliminate pollutants.

In the conventional process, oxygen is provided by bubbling air to the reactors for the microbes to degrade the organic pollutants. However, in the SANI process, no oxygen is required.

The sulfate-reducing bacteria will use sulfate as the medium to oxidize the organic pollutants into carbon dioxide and sulfide. After that, oxygen will be provided to convert the sulfide back to sulfate, thus completing the treatment process.

Since the sulfate-reducing bacteria grow very slowly, the SANI process minimizes sludge production by 90 percent.

During a pilot plant trial in Tung Chung, no sludge disposal was required over a 225-day operation.

This reaffirmed that the SANI process can practically minimize the need for sludge disposal, and reduce 50 percent of sewage treatment costs, 50 percent of space requirements and 35 percent of carbon dioxide emission.

With full support from the Drainage Services Department and the government's Innovation & Technology Fund, a large-scale demonstration run of the SANI process will be conducted at Sha Tin Sewage Treatment Works later this year.

Our pioneering work earned five international awards last year including the Huber Technology Prize of Germany, Finalist of the World Smart Cities Awards of Spain and three other prestigious awards of the International Water Association.

We were also invited by the Unesco-IHE Institute of Water Education to jointly develop these technologies for developing countries hard hit by water scarcity, such as Cuba.

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