Q&A

11Q7: Recently, water level of the river has dropped, because of no rain, and seawater has risen up the river and reached to the intake. Consumers complain that the tap water is salty. What measures against above problem has been taken in Japan? (N.M. Thailand)

A：In Japan, many big cities near the coast prevent seawater from going up a river by the construction of estuaries dams. However, when the river is used to transport various objects and people, it is difficult to build an estuaries dam. Another measure is to relocate the intake point to upstream where salt water does not influence. However, it can be also difficult in some cases, so I introduce three cases implemented in Japan for reference.

1. Example of constructing a temporary soil dike only during drought

The water utility in Hitachi City takes water from two sources, the Kuji River and the Juo River, and treats them separately. The intake point of the Kuji River is 4.3km upstream from the river mouth. Under the influence of recent abnormal weather, the river water level drops during low rainfall and seawater goes up and reaches the intake. In that case, the water utility stops water intake temporary. If such a situation is prolonged, they construct a temporary dike on the downstream side of the intake to narrow the river width for strengthening the flow from the upstream and prevent seawater from running up. Furthermore, stable water supply is ensured by partially utilizing water from the Juo River system.

Construction work of the temporary soil dike in Kuji River

(*Quoted from Hitachi City Water and Sewerage Business Management Strategy 2018)

2. Example of using electro dialysis (ED)/ electrodialysis reversal (EDR) method

In the case that people have to use salty groundwater (brine) for drinking, because of no other water source, electro dialysis (ED) method are used in small islands in Japan. According to the reference (2013) of Ministry of Land, Infrastructure, Transport and Tourism (MLIT), ED has been used at 8 water supply facilities (100m^3 /d and more) to lower high concentration of chloride ion, hardness, nitrate/nitrite nitrogen in groundwater. Their sizes are small, ranges from 125 m^3 /d to 3,300 m^3 /d. Oshima-Town (Island), Tokyo has used relatively large-scale ED facilities in Kitanoyama WTP (ED capacity was 2,780m^3 /d, installed in 1988) and in Nambu WTP (ED capacity was 1,640m^3 /d, installed

in 1993). However, due to the elapse of the service life, the two facilities have been replaced with electrodialysis reversal (EDR) which was an improved system of ED in 2011. Water treated by EDR has been mixed with other well water and distributed.

3. Example of using reverse osmosis (RO) membrane method

According to the reference (2013) of MLIT, there are 40 water facilities (100 m^3 /d or more, since 1989) which treat seawater and brine water by RO membranes in Japan. And 80% of them have production capacity of less than 1000 m^3 /d and 8 facilities exceed 1,000 m^3 /d. The Chatan Water Treatment Plant in Okinawa Prefecture and the Fukuoka District Water Treatment Plant in Fukuoka Prefecture desalinate seawater. The capacity is 40,000m^3/d and 50,000m^3 /d respectively. Both capacities are the largest class in Japan.

1) Desalination case of brine groundwater

In Irabu Island, Okinawa Prefecture, Irabu WTP treated10 groundwater wells by two methods. One method was slow sand filtration + chlorination and another was slow sand filtration + low pressure reverse osmosis membrane + chlorination, since some of 10 groundwater wells had high concentration of chloride ions and evaporation residues. And treated water by two methods are mixed and 3600m^3/d treated water in total was supplied to people from 2000. However, in 2015, when the Irabu Bridge was newly constructed between Irabu Island and Miyako Island, the water distribution pipe was attached to the bridge. Water treated in Miyako Island has been sent to Irabu Island. Now, the RO membrane facility is not used but kept for future use.

*Quoted from 2010 Outline of water supply in Okinawa Prefecture, Miyako Mainihi newspaper H.P. 2015 (website)

2) Desalination case of seawater

The desalination facility in Fukuoka City started operation in 2005 as a measure against drought. The water intake is 640m off the Genkai Nada Bay, and the seawater is filtered by the sand and gravel filtration facility constructed at the bottom of the sea. The filtered seawater is sent to WTP and the microorganisms and ultrafine particles are removed by pretreatment (UF membrane). Then the pretreated seawater is desalinated by the high-pressure RO membrane. The boron concentration in some of the desalinated water is reduced by the low-pressure RO membrane. Then all desalinated water is added with minerals and mixed with safe water which treated the river water. The wastewater of the high-pressure RO membrane is discharged into the sea together with the sewage treatment water to reduce the salt concentration, and the wastewater of the low-pressure RO membrane is returned to the UF membrane facility.

*Quoted from Seawater Desalination Plant in Fukuoka Area, Mr. Morita Yukio, 2011 (web site)

(Information by Mr. Arimura, quoted and edit by Ms.Yamamoto)