

Q&A

21Q7: We want to change the disinfectant from the chlorine (Cl₂) gas into sodium hypochlorite (NaClO) by thinking about safety in our water treatment plant. And there are two options for getting NaClO, commercial NaClO and house generation system of electrolysis method. Please compare the two methods of NaClO. And how many Watt of electric power are necessary for producing 1g NaClO ?
(Mr. M.N. Cambodia)

A1: Example of Otaki WTP (Chiba prefecture)

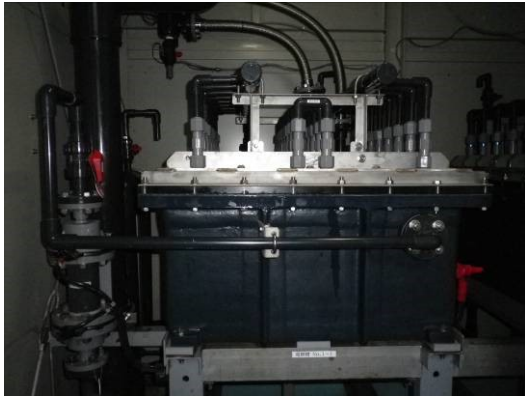
Bulk water supply of the Otaki WTP was commenced for Minamiboso area in 1996. It is relatively new WTP, which purify the raw water taken from Tone River and conveyed through Boso canal – Nagara dam – Minamiboso canal.

It takes 3-4 days for treated water to reach to Shirahama area in Minami - Boso city which is the furthest supply area. Therefore, we dose powder activated carbon in raw water and dose chemicals in the treatment process carefully for controlling the tri-halo-methane in the transmission main. And also, we have two additional chlorine dosing points other than water treatment plant. We have been using NaClO produced at the house generation system by electrolysis method as disinfectant since commencement of the Otaki WTP.

NaClO production capacity is 300kg/d. The process of produced NaClO is firstly to dissolve salt in the water, to make saturation of salt, to send the solution to generator by pump. At the electrolysis tank in the generator, NaClO (1% concentration of available chlorine) is produced. Salt can be kept long time without changing quality. We buy salt seven times a year by dump track for the WTP and by 20kg/sack for additional chlorine dosing system. NaClO generation system is operated automatically using night time electricity charge which is



NaClO injector



Electrolysis tank of NaClO generator



NaClO storage tanks

cheaper than daytime. Two storage tanks of NaClO are installed outside, and concentration of NaClO doesn't decrease.

We calculated the cost of house generation system in 2009 following

(a) NaClO production : 2,128,000 kg/y Material: Salt 59,570kg about ¥2,600,000 /y

(b) Electric power: operation time 1,700 hours Electricity consumption about 85,000kwh

Cost is about ¥1,000,000 (basic charge not included)

(c) Maintenance cost (washing of electrodes by acid, re-coating of electrodes, and others) ¥5,000,000/y as average of 10 years (a)+(b)+(c) = about ¥8,600,000 /y Capacity of WTP is 55,060m³/d. Actual transmission volume is 11,225,001m³/y. Day-average transmission volume is 30,753m³ /d. Construction cost of generation system was about ¥ 140,000,000 (dosing facilities and storage tanks were not included)

Comparing the commercial NaClO, the merit and demerit of produced NaClO are follows.

Advantage:

- It is possible to control delicate dosing because 1% concentration of available Cl₂
- There are no gas generation in dosing pipe and a few separation of crystalline matter relatively
- Storage tank can be installed outside (Commercial NaClO produce chlorine oxygen in high temperature and air conditioner is necessary)

Disadvantage:

- High initial cost
- High maintenance cost

(Answerer: Mr. IMAZEKI Hiroshi, Minami Boso wide area water supply authority, 2011)

* (Reference)

Cost of commercial NaClO Cost changes by area and distance from the factory when using the large tanker truck. K city waterworks department procures NaClO by 3t-large tanker truck and 200kg polyethylene containers. Unit costs of NaClO in 2009 were ¥ 39.27/kg by 3t- large tanker truck and ¥ 63.00/kg by 200kg polyethylene container respectively. Commercial NaClO has 12% concentration of available Cl₂ and produced NaClO has 1% concentration, so that Volume of commercial NaClO would be one twelfth of produced NaClO in volume. Commercial NaClO needs gas out equipment.

(Mr. ODASHIMA, Ms. YAMAMOTO)

A2: Example of S City in Japan

A certain WTP in S city has produced 1,899,580kg of NaClO by electrolysis method in 2009 and consumed 89,390kwh of electric power. By the way, this system cost was ¥200,000,000 around.

(Mr. ODASHIMA)

A3: Example of Hue province water supply company, Vietnam

We use house generation system for producing NaClO in Quang Te II WTP and supply it to the Quang Te I WTP too. Production capacity of the Quang Te I and Te II WTPs are 100,000 m³/d in total. Produced NaClO volume is 35–40m³ /d (concentration is 5.0g/L as NaClO and 0.48% as available Cl₂).

Dosing rate of Cl₂ is 1.6mg/L. 7.58wh electric power is consumed for producing 1g NaClO. Production rate is 1.24m³/hour or 6.2kg/hour. We use it in the small scale WTP in remote area. Capacity of generation



Electrode for Small Scale NaClO Generator

is 300~400 m³/d. NaClO production volume is 5g/L as NaClO concentration and 1.6mg/L as available Cl₂. We also use house generation system in Yavia WTP.

(Answerer: Ms. Tran Thi Minh Tam and Mr. SASAYAMA, 2011)