

## Incident Report on Dosing Sodium Hypochlorite above 20 mg/L in SCISTW

### 1. Background

In the recent discussion with EPD, a proposal on the Trials for Increasing Sodium Hypochlorite Dosage in SCISTW (Appendix I) was prepared to obtain more data for establishing the relationship between chlorine dosage, chlorine demand and the effluent E.coli level in the disinfection process of the Final Disinfection Facilities.

Under the Section 4 of the proposal, it was stated that the hourly average of the Total Residual Chlorine (TRC) before de-chlorination would be controlled within the normal operation range (i.e. below 4 mg/l) to avoid adverse environmental impact under the emergency discharge situation.

To facilitate the above trials, both the chlorination and de-chlorination systems are required to undergo a series of stress tests to verify its performance and reliability under the dosage condition above 20mg/L.

During the test period, the TRC before and after de-chlorination at Chamber 15A were monitored continuously.

### 2. Testing Schedule and Result

Date	Time	NaOCl dosage Rate (mg/L)	TRC before de-chlorination (mg/L) *	TRC after de-chlorination (mg/L) **
1.7.2016	0700 to 1100	24	0.3	0
2.7.2016	0700 to 1100	24	0.8	0.1
3.7.2016	0700 to 1100	24	1.3	0
4.7.2016	0700 to 1100	24	1.4	0.1
5.7.2016	0700 to 1100	24	1.8	0.1
6.7.2016	0700 to 1100	24	1.4	0.1
7.7.2016	0700 to 1100	24	2.2	0.1
8.7.2016	0700 to 1100	24	0.8	0.1
9.7.2016	0700 to 1100	24	0.5	0.0
10.7.2016	0700 to 1100	24	0.7	0.1
11.7.2016	0700 to 1100	24	1.0	0.1
12.7.2016	0700 to 1100	24	0.5	0.0
13.7.2016	0700 to 1100	<ul style="list-style-type: none"><li>▪ 24 (from 0700)</li><li>▪ 19 (from 0812)</li><li>▪ 24 (0952 to 1100)</li></ul>	0.7	0.1
14.7.2016	0700 to 1100	24	0.9	0.0
15.7.2016	0700 to 1100	24	1.0	0.1
16.7.2016	0700 to 1100	24	0.5	0.1
17.7.2016	0700 to 1100	24	0.4	0.0
18.7.2016	0700 to 1100	24	0.9	0.0
19.7.2016	0700 to 1100	24	0.6	0.0
20.7.2016	0700 to 1100	24	1.0	0.0
	1110 to 1134	24	1.5	0.0
21.7.2016	0700 to 1445	24	1.1	0.0
	1445 to 1600	22	1.1	0.0

Date	Time	NaOCl dosage Rate (mg/L)	TRC before de-chlorination (mg/L) *	TRC after de-chlorination (mg/L) **
22.7.2016	0700 to 1100	24	0.4	0.0
23.7.2016	0700 to 1100	24	0.3	0.1
24.7.2016	0700 to 1100	24	0.1	0.0
25.7.2016	0700 to 1100	24	0.1	0.0
26.7.2016	0700 to 1100	24	0.5	0.1
27.7.2016	0700 to 1100	24	0.2	0.0
28.7.2016	0700 to 1100	24	0.5	0.0
29.7.2016	0700 to 1100	24	0.3	0.0
30.7.2016	0700 to 1100	24	0.2	0.0
31.7.2016	0700 to 1100	24	0.2	0.0

### 3. Conclusions

During the above test periods, the TRC before and after de-chlorination were controlled within the normal operation range and license requirement (0.2 mg/L) respectively. In this connection, the environmental impacts associated with the dosage increase are acceptable and within the envelope of EIA.

The subject test will continue in the following week and the result will be uploaded to the dedicated website accordingly.

\* hourly average TRC figure, in accordance with Clause 5.92 of the EIA report

\*\* 95 percentile TRC figure, in accordance with the Discharge Licence

## **Trials for Increasing Sodium Hypochlorite Dosage in SCISTW**

### **1. Background**

The new chemically enhanced primary treatment (CEPT) facilities at the SCISTW under HATS Stage 2A have been put into operation since December 2015. The Final Disinfection Facilities (FDF), the other main treatment process, have also started to receive effluent for disinfection since 25 January 2016 and are now undergoing the testing and commissioning (T&C) period until end January 2017. The WPCO license for *E.coli* has also been tightened to 100,000 count/100 mL in March 2016 and then to 20,000 count/100 mL in June 2016.

The prediction on the operational chlorine dosage of 10-14mg/l under the Environmental Impact Assessment Report for the Provision of Disinfection Facilities at Stonecutters Island Sewage Treatment Works (EIA)\* was based on the bench-scales test conducted in 2002-2005, without the support of actual operation data. Upon acquiring the experience in Advanced Disinfection Facilities (ADF) since 2009 and then FDF earlier this year, we find that there is a deviation in chlorine demand under the actual situation.

In order to obtain more data for establishing the relationship between chlorine dosage, chlorine demand and the effluent *E.coli* level in the disinfection process of FDF, there is a need to carry out trials during the T&C period for the FDF with chlorine dosage beyond the current limit of 20 mg/L. Such trials will also be useful for providing additional protection to the bathing beaches in Tsuen Wan during the bathing season where necessary.

(\* The EIA was based on the ultimate flow scenario of 2,341,600 m<sup>3</sup>/day while currently, the SCISTW is receiving a daily flow of less than 2,000,000 m<sup>3</sup>/day.)

### **2. Proposal**

It is proposed to conduct trials during the T&C period for the FDF for a range of chlorine dosage levels from 21mg/L to 25 mg/L. The trials will be conducted by means of progressive increase in dosage having due regard to various factors including Total Residual Chlorine (TRC) in the effluent, the *E. coli* standard of the effluent, the ambient temperature and daily dosage pattern.

During the trial, the data of chlorine dosage and TRC will be collected and the chlorination process will be monitored closely with the online monitoring system to ensure the chlorine dosage under the trials will not deviate from the pre-selected level(s). Also the TRC before de-chlorination at Chamber 15A will be closely controlled within the normal operation range, such that the hourly average of TRC before de-chlorination will not exceed 4mg/l, according to clause 5.92 of the EIA report. Following the prevailing practice, the dechlorination system will also be under close monitoring to ensure sodium bisulphite dosage is adequate to cater for the TRC removal while the discharge limit of TRC at 0.2 mg/L (95 percentile) would be complied with the licence requirement under the Water Pollution Control Ordinance.

During the trial period, the water quality monitoring and audit as specified under the

Revised Final Environmental Monitoring and Audit (EM&A) Manual will continue. For the reporting of chlorine dosage over 20mg/l under clause 4.7 of the EM&A Manual, we will inform EPD once the trial has commenced and report the daily dosage rate on a monthly basis, after the first incident report.

### **3. Impact on Effluent and Environment during Normal Operation**

The proposed trials for increase in chlorine dosage will not cause an increase in TRC level or unreacted dechlorination chemicals (i.e. sodium bisulphite) level in the discharge effluent because the TRC level is closely monitored within the operational range (1 – 4mg/L) before de-chlorination and within the discharge limit of 0.2 mg/L at all time after de-chlorination. In fact, there has been no exceedance of TRC in the effluent discharge above 0.2 mg/L since the ADF operation in 2009.

Accordingly, the impact on human health risk, ecological risk and marine ecological impact and fisheries due to formation of chlorination by-products (CBPs) would also be controlled within the criteria as indicated in the EIA and EM&A Manual. In accordance with clause 5.169 of EIA, the values of CBPs will comply well with their corresponding ambient water objectives. Furthermore, our monitoring has all along confirmed the compliance of CBPs within the limit under clause 4.13 of EM&A Manual.

### **4. Impacts on Effluent and Environment during Emergency Discharge of Chlorinated Effluent**

In accordance with clause 5.92 of EIA, it set out the worst case scenario of emergency discharge of chlorinated effluent without de-chlorination in the strength of 5.5mg/l of TRC for one hour under HATS 2A stage and concluded that, under clause 5.208, the impact will be localized and temporary.

Under the trial period, the hourly average of TRC before de-chlorination will be controlled below 4 mg/l, which is below the level under the EIA and thus it can be concluded that the water quality impact due to emergency discharge will be within the acceptable limit.

Also, the de-chlorination plant has been designed to be a very robust system with no emergency bypass case under clause 4.65 of EM&A Manual since its operation in 2009.

### **5. Conclusions**

The proposed trials for increase in chlorine dosage are necessary for obtaining more data for establishing the relationship between chlorine dosage, chlorine demand and the effluent *E.coli* level in the disinfection process of FDF. The environmental impacts associated with the dosage increase are acceptable and within the envelope of EIA. Monitoring under the E&MA Manual will be continued and the reporting under clause 4.7 will be carried out on a monthly basis, after the first incident report.