

NOTE FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

Supplementary information on 352DS - Harbour Area Treatment Scheme, stage 2A - construction of advance disinfection facilities at Stonecutters Island sewage treatment works

INTRODUCTION

In considering the paper referenced PWSC(2007-08)68 on the above project on 21 December 2007, the Public Works Subcommittee requested the Administration to provide information on the survey on the disinfection practices of 132 sewage treatment works in 24 coastal cities.

THE ADMINISTRATION'S RESPONSE

Purpose of Survey

2. A survey on the disinfection practices in other coastal cities was completed in 2006 under the "Harbour Area Treatment Scheme (HATS) - Environmental Impact Assessment Study for the Provision of Disinfection Facilities at Stonecutters Island Sewage Treatment Works". The purpose of the survey was to gather information on the current practices and the trends in disinfection technologies in other coastal cities with similar marine discharge conditions as HATS. Information gathered from the survey was used as a reference in evaluating the disinfection options for HATS.

Selection of Coastal Cities for Survey

3. There are altogether about 230 coastal cities in North America (24), Europe (57) and Asia/Australia/New Zealand (149), each having more than 200 000 inhabitants. To design a cost-effective survey of manageable scale, the coastal cities meeting the following key criteria were short-listed for the survey -

- Significant population;
- Well-established requirements for wastewater treatment and disinfection;
- Well-developed sewage treatment and disposal systems; and
- Marine discharge of the treated effluents.

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4. A total of 24 coastal cities were selected for the survey, including eight (8) in North America, seven (7) in Europe and nine (9) in Asia/Australia/New Zealand, as listed below. 132 sewage treatment works (STWs) in these cities, each with a design capacity of not less than 10 000 cubic metres (m³)/day, were covered in the survey.

<u>North America (8 cities)</u>	<u>Europe (7 cities)</u>	<u>Asia/Australia/New Zealand (9 cities)</u>
- Vancouver, Canada	- Bremen/Bremerhaven, Germany	- Guangzhou, China
- Halifax, Canada	- Hamburg, Germany	- Shanghai, China
- Boston, USA	- Cardiff, Wales	- Kaohsiung, Taiwan
- Honolulu, USA	- Swansea, Wales	- Tokyo, Japan
- Los Angeles, USA	- Dublin, Ireland	- Singapore
- Miami, USA	- Edinburgh, Scotland	- Bangkok, Thailand
- New York, USA	- London, England	- Melbourne, Australia
- Seattle, USA		- Sydney, Australia
		- Auckland, New Zealand

Information Collected in Survey

5. For each of the cities selected, key information collected included:

- the city's sewage treatment system including the number of treatment plants, and the design capacity and treatment process of each plant;
- the current disinfection practices and years of commissioning;
- the disinfected effluent standards;
- the discharge location of disinfected effluent; and
- information on any upgrading plan in the next five years.

Disinfection Practices in Surveyed Cities

6. Among the 132 STWs surveyed, chlorination/dechlorination is the most commonly used disinfection technology in these cities, treating some 58% of the effluent. UV radiation only accounts for about 5% and some 36% receives no disinfection before discharge. Other disinfection technologies are rarely used and account for less than 1%. Table 1 summarizes the survey results.

/Table

Table 1 – Summary of Survey Results

	Disinfection Technology	Number of STWs	Total Flow Capacity (M m ³ /d*)	% (flow)
With Disinfection	Chlorination/dechlorination	66	22.6	58%
	UV radiation	20	1.8	5%
	Others	1	0.3	1%
Without Disinfection	N/A	45	14.0	36%
		132	38.7	100%

* M m³/d = million cubic metres per day

Disinfection Practices in Large STWs

7. Considering the mega scale of the Stonecutters Island STW under HATS, we also analyzed the disinfection practices of the large plants among the 132 surveyed STWs. 75 of them are considered as large plants, each having a design capacity of more than 100 000 m³/day. Chlorination is the most commonly used disinfection technology, and is applied to about 59% of the effluent. The other disinfection technology, namely UV, is used to disinfect only about 4% of the effluent. About 36% of the effluent from these large STWs is discharged to receiving waters without disinfection. The analysis of these large plants is very close to that of all the surveyed STWs as presented in paragraph 6 above. Table 2 shows a summary of the disinfection practices in the surveyed large STWs.

Table 2 – Summary of Disinfection Practices in Surveyed Large STWs (>100 000 m³/d)

	Disinfection Technology	Number of STWs	Total Flow Capacity (M m ³ /d)	% (flow)
With Disinfection	Chlorination/dechlorination	44	21.7	59%
	UV radiation	4	1.3	4%
	Others	1	0.3	1%
Without Disinfection	N/A	26	13.3	36%
		75	36.6	100%

8. The largest STW using chlorination/dechlorination for effluent disinfection is the Deer Island STW in Boston, USA, which has a capacity of 1.8 million m³/day. Other notable STWs with large-scale chlorination facilities include the South STW in Seattle, USA (435 000 m³/day), the Orange County STW in California, USA (900 000 m³/day), and the two STWs in Guangzhou (total capacity of 1 million m³/day) which were commissioned in 2004.

Trend in Disinfection Technologies

9. Of the disinfection facilities commissioned in the surveyed cities in the last 10 years, chlorination/dechlorination is applied to some 75% of the installed capacity, while UV radiation is applied to the remaining 25% mostly for disinfecting secondary or tertiary effluents. For those facilities to be commissioned in the coming five years, the total flow capacity of the new UV radiation installations is similar to that of new chlorination facilities.

10. Based on the information gathered from the survey, the increasing use of UV radiation for disinfection is mainly for secondary/tertiary effluents. However, its application in primary effluents is less cost-effective due to the low UV transmittance and hence the need for a large number of UV lamps in such applications. UV radiation would also have environmental issues, such as the need to dispose of a large quantity of mercury lamps, and the high energy consumption, both of which would need to be addressed.

Experience Shared by Authorities of Surveyed STWs

11. During the disinfection practice survey, the authorities of the surveyed STWs shared with us their experience concerning the environmental impacts due to the discharge of chlorinated/de-chlorinated effluents to the marine environment. We were advised that no unacceptable environmental impact on the receiving waters had been observed.

12. It was also noted from the survey results that the selection of disinfection technology for any STW was usually site-specific and the final choice was made with due consideration to the environmental, technical, cost and other factors. This is a similar approach to that adopted for HATS.

/Conclusion

Conclusion

13. The survey has been carried out in an objective and professional manner. The information gathered provides a general overall picture on the disinfection practices currently or to be adopted in many major coastal cities scattered across several continents. It has been a useful reference in the selection of disinfection technology for HATS.

Environment Bureau
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