

DRINKING WATER SAFETY ADVISORY COMMITTEE

Research and Development on Drinking Water Quality

PURPOSE

The Water Supplies Department (“WSD”) has been actively conducting Research and Development (“R&D”) in various aspects of water supplies. This paper aims to inform Members on the R&D work of WSD and its R&D projects related to drinking water quality.

WSD R&D STEERING COMMITTEE

2. WSD has established the R&D Steering Committee (“the Committee”) chaired by the Deputy Director of Water Supplies for overseeing the R&D work in WSD as detailed below:

(a) **Initiating and overseeing R&D Projects**

The Committee will initiate R&D projects for meeting the operational needs of WSD. In addition, the Committee will identify suitable subjects for initiating R&D projects from the Radar System and through the biennial tea gathering with local academia and institutes and subsequent discussion with them as detailed in sub-paragraph (b) and (c) below respectively. The Committee will conduct quarterly review to monitor the progress of the R&D projects, evaluate their outcomes and recommendations and determine the implementation plan for their application (if feasible and beneficial) in WSD.

(b) **Radar System**

The Committee has established a Radar System with a view to keeping WSD abreast of the water related events, advanced technologies in water supply, latest development in the global water industry, etc. Representatives from different branches/divisions of WSD have been assigned to regularly review reports, journals and websites and write up summary reports each month for uploading to the Radar Data Repository System for sharing among colleagues in WSD. In respect of water quality, the Radar System will regularly review reports,

journals and websites of the renowned organisations and institutes such as the World Health Organizations, US Environmental Protection Agency, American Water Works Association, etc. In addition, the Committee will identify from the summary reports those topics that worth further exploration for initiating R&D projects.

(c) Biennial tea gathering with local academia and institutes

The Committee organises regular biennial tea gathering with local academia and institutes for interflow on latest water issues and exploration of collaboration on R&D in various areas. For subjects where there are potential for R&D collaboration, WSD will further discuss with the academia and institutes with a view to engaging them to undertake R&D projects on the subjects.

R&D PROJECTS RELATED TO DRINKING WATER QUALITY

3. WSD has all along been commissioning quite some R&D projects on drinking water quality. Some notable projects completed in recent years are as follows -

(a) Biosensing Alert System (“BAS”)

WSD has developed and patented an innovative BAS which automatically monitors the real-time movement of zebra fishes in raw water supplied to water treatment works (“WTW”) in a specially designed aquarium round the clock. By monitoring any abnormal movement of the zebra fishes and coupling with an auto-sampler and rapid toxicity testing system based on the bioluminescent technology (light-emitting bacteria), the BAS can provide early alerts and rapid screening of contaminants if they are present in the raw water supplied to the WTW.

(b) Olfactometer

WSD has designed and developed an Olfactometer to improve sensitivity and efficiency of odour detection in the final water at WTW, which enables timely adjustment of the water treatment process to remove off-favour compounds, e.g. 2-Methylisoborneol (“MIB”).

(c) Phosphate removal

WSD has conducted an R&D project and developed the methodology

of using magnetic particles for removal of phosphate by physical adsorption with acceptable regeneration efficiency of the magnetic particles using a binary solution of sodium chloride and sodium hydroxide. The real life application of the methodology for removal of phosphate in Lam Tsuen River within the water gathering ground is being explored.

(d) Water treatment

WSD has conducted several R&D projects on water treatment including (i) application of biological filter for removal of disinfection by-products and ammoniacal nitrogen, (ii) removal of soluble manganese by applying auto-catalytic oxidation reaction using manganese coated sand on filter media to address the discoloration problem of final water caused by manganese, and (iii) improvement of the turbidity in the final water as a result of using hydrated lime in water treatment by removal of lime debris during the chemical preparation process using devices such as lime saturator.

4. Currently, WSD is conducting the following R&D projects related to water quality:

(a) Organophosphate Flame Retardants (“OPFRs”) and Perfluoroalkyl Substances (“PFASs”) in the drinking water of Hong Kong

The project collects and analyses water samples from selected water treatment works of different raw water sources (i.e. local catchment, local impounding reservoir and Dongjiang water) to study the source and fate of those OPFRs and PFASs in the drinking water in Hong Kong and takes snapshots of their background levels against the corresponding health guideline values in various jurisdictions.

(b) Biological removal of MIB at WTW

The project studies the removal efficiency of MIB by microbes in plant scale by retrofitting a clarifier with biomedica at Ma On Shan WTW with a view to reducing consumption of powdered activated carbon for removal of MIB.

(c) Profile of MIB formation after algal bloom in impounding reservoir

The project is a bench scale study in laboratory to correlate the MIB profile with factors including algal species and environmental conditions, e.g. sunlight, water temperature etc., after an algal bloom

event.

(d) Application of Unmanned Surface Vessels (“USV”) for real-time raw water quality monitoring and sampling at impounding reservoirs

The project is to develop an USV system capable of performing auto-navigation based on preset Global Positioning System data and capturing synchronously real-time monitoring data into a 2-D graphic for each water quality parameter (e.g. water temperature, turbidity, pH, chlorophyll-a, electrical conductivity, dissolved oxygen and blue green algae level) across the reservoir surface. The data gathered can give early alert to the downstream WTWs in case there is any abnormality of the raw water quality.

5. WSD is also looking into new R&D initiatives, including the following:

- (a) Investigation of the potential risks of antibiotics in raw water and search for available testing methods/services to for snapshot tests of the background levels of antibiotics in the raw water in Hong Kong;
- (b) Exploration of the methodology and advanced technology for removal of refractory chemicals in water, e.g. MIB, antibiotics, estrogens and other emerging chemicals; and
- (c) Application of floating wetland for control of eutrophication in impounding reservoirs.

**Development Bureau
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