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Drainage Services Department
Government of the Hong Kong SAR

***RESEARCH & DEVELOPMENT
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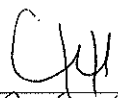
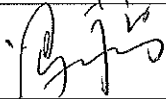

***Full Scale Trial for
Superoxygenation Technology for
Tung Chung Sewage Pumping Station***

(Final Report)

**Research and Development Section
Electrical & Mechanical Projects Division
Drainage Services Department**

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Executive Summary

1. Septic sewage is one of the major causes of malodor in the Drainage Services Department (DSD) sewerage facilities. It is usually generated due to long retention time in the conveyance sewer before entering the sewerage facility. In the absence of both oxygen and nitrate, bacteria will utilize the sulphate present in sewage as oxygen source to produce hydrogen sulphide (H_2S) via anaerobic reactions. The depletion of oxygen in sewage is mainly due to the present of high organic matters in the sewage.
2. The odor problem in Siu Ho Wan Sewage Treatment Works became an issue as the malodourous gas was experienced by the users along the North Lantau Highway in Hong Kong. Nitrate was added at the inlet of rising main at Tung Chung Sewage Pumping Station and deodorizers were installed at the discharge of the rising main.
3. In order to further address the concern of public and to effectively eliminate the odor, a new technology based on Henry's Law, Superoxygenation technology, developed by Dr. R. E. Speece in the United States was identified. Overseas experience showed the system had the capability to substantially increase the amount of dissolved oxygen (DO) in raw sewage so that generation of hydrogen sulphide as a result of insufficient oxygen in sewage is suppressed.
4. A desktop review of the application of the Superoxygenation technology for sewage septicity control in Hong Kong had been conducted under Item No. RD 2042 by R&D Group of E&MP Division, DSD in 2007. The study reviewed the feasibility of applying the Superoxygenation technology to Tung Chung SPS and the conclusion is positive. Moreover, a DSD delegation had visited an existing full-scale plant utilizing the Superoxygenation technology at California, US in May 2007.
5. In July 2010, a full scale Superoxygenation trial scheme was conducted at Tung Chung Sewage Pumping Station, which is located at the upstream of the long rising main to Siu Ho Wan Sewage Treatment Works. The system has a designed capacity to cope with the peak flow of sewage of 45,000 cu m./day at a dissolved oxygen level above 50 mg/L so as to eliminate the formation of hydrogen sulphide in the rising mains. System commissioning tests carried out in summer and winter of 2010 proved that the Superoxygenation system could really dissolve gaseous oxygen into sewage at a level of at least 60 mg/L most of the time, and the suppression of H_2S formation along the whole rising main was successful. Performance of the Superoxygenation system was sensitive to factors such as the hydraulic retention time, sewage temperature and salinity. Continuous operation of the Superoxygenation system was essential to obtain a consistent oxygenation results. The recurrent cost of using Superoxygenation technology was more or less the same as that of using traditional chemical dosing method, but subjected to changes on the market rates of chemicals.