

Construction of Sewage Treatment Works at Yung Shue Wan and Sok Kwu Wan, Lamma Island

Lamma Island, an outlying island without any centralised public sewerage systems at present, where sewage treatment by individual house owners using primitive soak-away methods is still in place. The Drainage Services Department (DSD) of the HKSAR government is carrying out a project to build village sewerage systems, sewage treatment plants, pumping stations and submarine outfalls in the two main residential areas on the island, namely Yung Shue Wan (YSW) and Sok Kwu Wan (SKW), to allow enforcement of sewage collection in villages to proceed, foreshadowing a breakthrough in the improvement of the water quality in its coastal waters.

This project implementation is split into two phases - the “Stage 1 Village Sewerage Works” contract and the “Sewage Treatment Works” contract. The first contract started in January 2008 and was substantially completed in March 2011 to allow sufficient time for sewer connection by the village houses, while the second contract (with major works) commenced in May 2010 and the plants are scheduled for commissioning in 2013. Provisions of temporary sewage treatment facilities are also included in the second contract to treat any sewage received before commissioning of the plants.

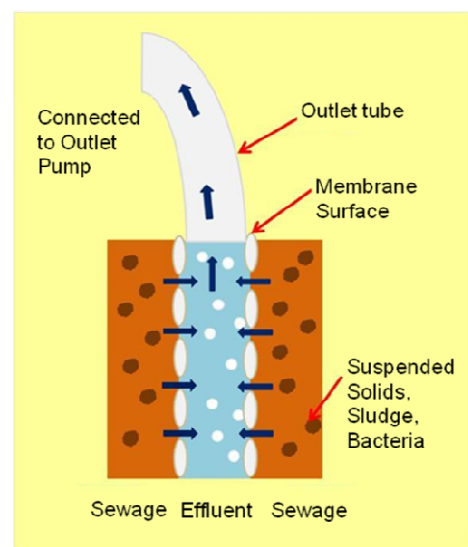


**Photomontage of the Yung Shue Wan
Sewage Treatment Plant**

The project embraces the following 3 groundbreaking attempts:

1) Using membrane bioreactor (MBR) in medium size municipal sewerage treatment plant for a populous district

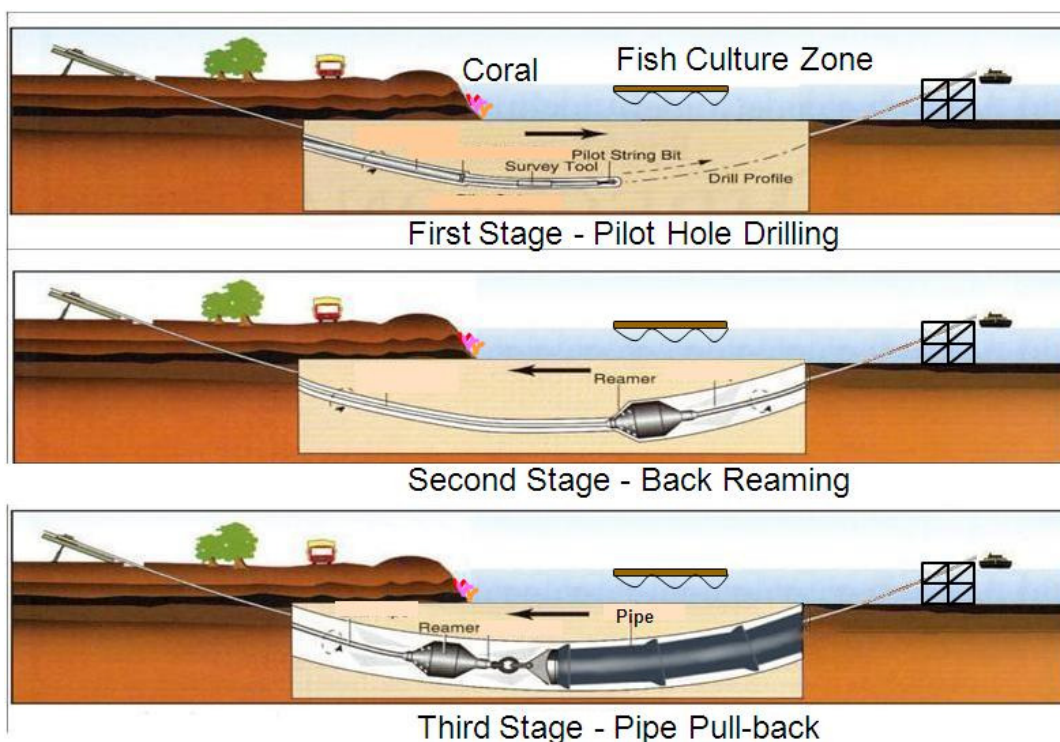
It is the first time that DSD uses MBR technology in medium size sewage treatment works in Hong Kong. The MBR modules consist of membrane panels placed in sewage for use in siphoning water through 0.4 micrometre pores by pumping. The flow of suspended solids, sludge and bacteria (including E. Coli) in the MBR panels is blocked due to the filtration at the pores of the membrane panels.



Merits of MBR	
a)	Suitable for operation under high concentrations of mixed liquor suspended solids, possibly leading to reduction in sizes of the sewage treatment tanks
b)	No need for sedimentation and disinfection process in traditional sewage treatment process
c)	Long sludge retention time, prompting more effective decomposition of organic compounds by micro-organism
d)	Less sludge produced
e)	Smaller footprint for the sewage treatment plant
f)	Possible re-use of treated effluent for dilution of chemical

2) Applying Horizontal Directional Drilling (HDD) technology in a “land to sea” circumstance

Given the presence of corals and fish culture zones in the offshore areas in YSW and SKW respectively, the DSD decides to apply HDD technology for construction of the two submarine outfalls in these areas to slash the extent of dredging works to an absolute minimum. It is the first time in Hong Kong to proceed with HDD works in a “land to sea” circumstance. That means the receiving operations would be done under marine conditions. Such a groundbreaking attempt is full of challenges which have not been unfolded through the common “land-to-land” type HDD operations. The HDD construction in this project consists of three stages - pilot hole drilling, back reaming and pipe pullback operation (see the illustration below).



Stages for Horizontal Directional Drilling

Using the HDD method, the construction of submarine outfalls will only require dredging at the outmost pipe end for installation of diffuser. Pipes are installed by drilling through the hard stratum under the sea bed and will not contaminate the seawater. By comparison with the traditional construction method, the HDD method can avoid dredging for the pipe installation, preventing unnecessary disturbance to the offshore corals and the fish culture zones. Furthermore, the amount of dredged sediment to be disposed of at dumping ground is greatly reduced.

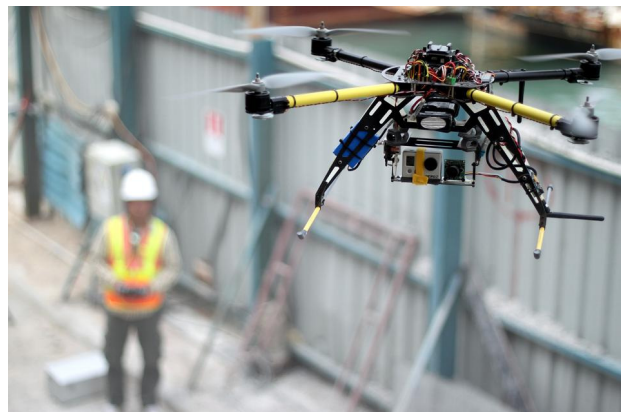
3) Adopting a remote controlled miniature helicopter device to take aerial photos and videos

This project is the first DSD project adopting a miniature helicopter device to take aerial photos and videos for monitoring progress of works. Such a device has the following advantages:

- ✧ Able to take 360° aerial photos and videos, with no limits on vantage point selection;
- ✧ All time standby for shooting; and
- ✧ More convenient and cost-effective as compared with the conventional methods of taking aerial photos by helicopter/ aeroplane.



Miniature Helicopter Device



Miniature Helicopter Device Taking Aerial Video

The miniature helicopter device, which is controlled by a radio controller, can be used to take site photographs and videos at height in close proximity of work fronts at any time. With the help of the device, difficulties in shooting encountered on sites, such as lacking of suitable vantage points, can be resolved. Furthermore, instant monitoring of site activities covering a wide area, like submarine outfall pipe threading works, has become practicable.



Aerial Photo Taken by Miniature Helicopter Device on Yung Shue Wan Sewage Treatment Works



Aerial Photo Taken by Miniature Helicopter Device on Submarine Outfall Pipe Threading Works

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