

RESEARCH & DEVELOPMENT

REPORT NO. 2082

Micro-turbine Generator System

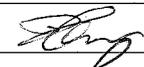
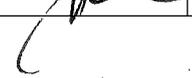
in

Yuen Long Sewage Treatment Works

(Final Report)

**Sewage Treatment Division One
Drainage Services Department
April 2015**

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Abstract

Biogas is one of the by-products in the secondary sewage treatment process with anaerobic sludge digestion. It can be used to produce heat and/or electricity, with the latter achieved by means of combined heat and power (CHP) generator system at three major secondary sewage treatment works at Shatin, Tai Po and Shek Wu Hui in Hong Kong. Traditionally, the biogas generated at Yuen Long Sewage Treatment Works (YLSTW) was utilized to heat up water solely by 2 nos. 880 kW gas boilers to maintain the temperature inside the sludge digesters. In summer, the requirement of hot water is comparatively lower than that in winter. According to the YLSTW's operating data in 2011, 45% of the biogas produced was flared off into the atmosphere.

In order to fully utilize the biogas produced for YLSTW with relatively low daily sewage flow of about 15,000 m³/day, a 30 kW micro-turbine generator system (hereafter called the micro-turbine) rather than the CHP system was installed at YLSTW to generate electricity as a pilot project. The installation works was commenced in August 2012 and completed in July 2013.

After one year of operation from August 2013 to July 2014, the micro-turbine was operated in normal conditions without any reportable breakdown. A total of 46,350 kWh of electrical energy was produced and about 36,612 m³ of biogas was consumed. Taking into account of the biogas utilized by the existing gas boilers, the biogas utilization rate of YLSTW was very close to 100% in the aforesaid period.

To sum up the above, the micro-turbine may be the only off-the-shelf product available from the market that could enable full utilization of the biogas produced from YLSTW. Although the immediate cost benefits obtained from trial use of the micro-turbine may not be significant, it could help minimizing the greenhouse gas emissions from YLSTW despite its relatively lower sewage flow. Considering also on other merits such as its simplicity, scalability and low maintenance requirement, it is considered that the micro-turbine could be a favourable option in sewage treatment works with low biogas production rate similar to that of the YLSTW.