# Sullage water treatment using CDS technology in Malaysia

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Sullage water is neither considered in the Malaysia stormwater manual nor the sewerage guideline for developers. It is therefore allowed to flow into the drainage system, polluting rivers. The objective of this project was to achieve water quality index (WQI) class IIB in the effluent discharge at Tiong Nam urban area, Kuala Lumpur, Malaysia. The sullage water treatment plant (SWTP) uses continuous deflective separation (CDS) technology as gross pollutant trap, flocculation, bioreactor tanks with final capture of biomass and CDS hybrid inclined plate clarifiers. Water samples were tested for its WQI for three months and the WQI reportedly improved after implementing the SWTP, arriving at class IIA.

## THE CASE STUDY OF TIONG NAM URBAN AREA

Apart from installing various types of trash traps along rivers and more than 300 gross pollutant traps within the drainage system to improve the water quality of the Klang and Gombak rivers under phase one of the River of Life project, the federal government of Malaysia allocated additional funds to construct about 20 SWTPs. Hundreds of kilometres of drainage interceptors and pipelines were built to collect and channel the sullage water to these SWTPs for treatment before releasing the treated effluent into the rivers. The SWTPs were constructed in different parcels at different stages of completion, all of which were aimed at raising WQI from the current class IV and class IV — which are both not suitable for body contact — to class IIB which is suitable for body contact and recreational usage.

For WQI class IIB, the parameters tested for each influent and effluent were dissolved oxygen (DO), temperature, pH, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solid (TSS), ammoniacal nitrogen (AN), and Escherichia-coli (E-coli). Design and build subcontractor EcoClean Technology proposed an alternative design which was accepted. The completed SWTP was tested and commissioned before the outbreak of COVID-19 in 2020. The water quality sampling was carried out by an authorised independent team and the testing was by an independent laboratory. EcoClean continued to operate the plant via the supervisory control and data acquisition (SCADA) system during the lockdown.

The results were submitted to the authority regularly after 3 months of operation, along with weekly lab results done on the water quality of the effluent. The client, Kuala Lumpur City Hall, and the department of irrigation and drainage accepted the WQI results which were consistent with class IIA, a standard achieved beyond the targeted result of class IIB.

## METHOD

The plant operationally starts from the primary screening at the intake sump followed by the mixing process in the equalising tank. A series of submersible pumps are used to draw water from the equalising tank to feed directly with a CDS technology. The CDS technology was quoted in the fifth edition of wastewater engineering treatment and resource recovery as a grit separator for combined wastewater and stormwater.* The CDS technology indirect screening was also reportedly used for the first time in Malaysia (Fig. 1).

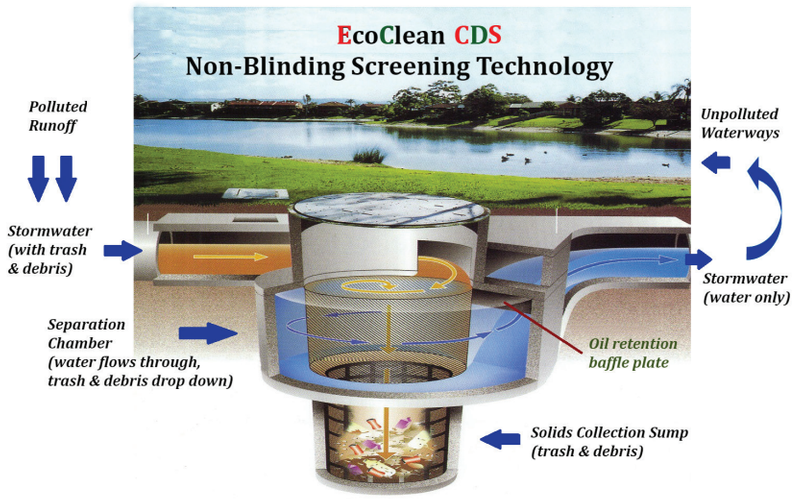


*Fig. 1: Illustration of CDS technology and indirect screening*

The second process after the CDS-gross screen separator (GSS) separation involves flocculation whereby the sullage water — treated by the CDS-GSS unit with 70% TSS removed — goes through the flocculation process. Further reaction will occur when the remaining fine particles form flocs and is further trapped by the next CDS-GSS unit which has a finer separation screen than the first CDS-GSS unit.

The trapped flocs residue will be purged — when it is full at the sump below the screen — to a separate dee bag sludge treatment process unit. The flow which has most of the fine TSS removed, will continue to reach the following detention tank for the biological treatment. The inside of this tank consists of suspended biofibre cords in submerged cages with cultured bacteria. Below these cages is the network of aeration piping with fine bubble diffusers. This is an aerobic process to enable attached growth on the biofibre chords to form a biofilm colony. Biofilm will consume the nutrients — organic and inorganic — from the sullage water.

With the expectation of biomass formation and shaken off as suspended biomass in the bioreactor tank under the constant supply of air, the fully treated sullage water is pumped through and further purified via the last unit of hybrid CDS-fine screen separator (FSS)-inclined plate clarifier (IPC) and stored in a clear water tank to be overflown out constantly to the adjacent Gombak river (Fig. 2).

## RESULTS

The WQI was calculated using six parameters: DO, BOD, COD, TSS, AN, and pH with the inclusion of intermediate subindices. Calculations were performed on the water quality parameters to find individual subindices to get WQI classification (Fig. 3). The WQI result on the first month of operation of Tiong Nam SWTP was 56.52 which fell under the polluted category as the system only kickstarted and the bacteria was not fully grown and mature. However, in the following months, the WQI fell under the clean category which are 90.28 and 92.01. Thus, the CDS units with integrated Tiong Nam SWTP treatment system had been effective in treating the polluted sullage water quality within a month of its commissioning.

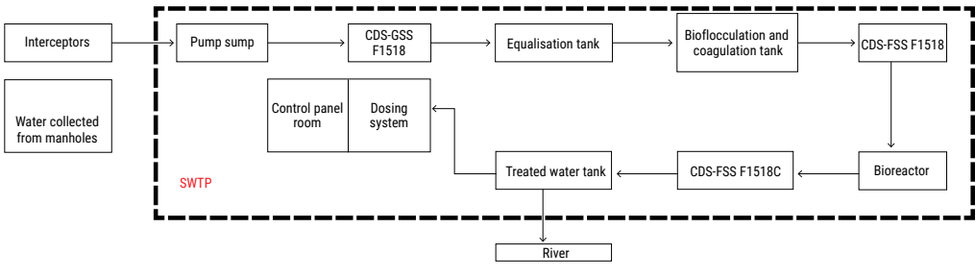


*Fig. 2: Overall Tiong Nam SWTP flow process designed by EcoClean Technology*

## CONCLUSION

This SWTP, designed by EcoClean Technology, made use of the CDS technology to treat sullage water in the rivers, which the WQI of class IV and V were raised to class IIA. The water quality of class IIA is considered a standard except for traces of E-Coli where further treatment like ozonation or UV disinfectant could be applied. Therefore, the stormwater loop has been closed and a circular economy is created by making effluents reusable for non-potable purposes.

**References are available upon request*

| Parameter | Index range | | |
|---|---|---|---|
| | Clean | Slightly polluted | Polluted |
| WQI | 81-100 | 60-80 | 0-59 |

*Fig. 3: WQI classification*

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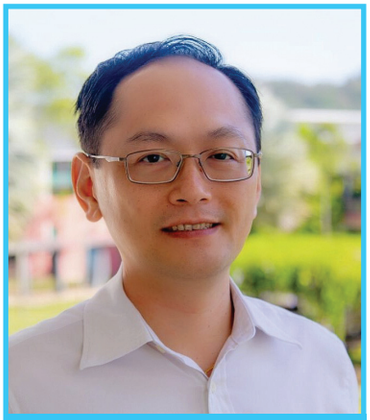

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