

ED-WAVE tool design approach: case of Limbe wastewater treatment works, Blantyre, Malawi

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ABSTRACT

The ED-WAVE tool is a PC based package for imparting training on wastewater treatment technologies. The system consists of four modules viz. Reference Library, Process Builder, Case Study Manager, and Treatment Adviser. The principles of case-based design (CBD) and case-based reasoning (CBR) as applied in the ED-WAVE tool are utilised in this paper to evaluate the design approach of Limbe wastewater treatment works (Limbe WWTW) in Malawi. The plant has an average dry weather flow rate of 1,800 m³/d. The study established that a similar case to both the dry season and wet season conditions of Soche wastewater treatment works has similarities to Municipal Case 1 in Sri Lanka, with a flow rate of 1,700 m³/d. The study further established that there are certain unit treatment processes that are important in wastewater treatment. These include a primary sedimentation process, achieved through the Imhoff tank at the plant in Sri Lanka, chemical precipitation followed by sedimentation as suggested by the dry season and wet season unit treatment processes, and the receiving pond in the actual set up at Limbe. Municipal Case 1 in Sri Lanka utilises trickling filters for aerobic biological treatment while the Limbe plant accomplishes this process through the facultative ponds. The suggested sequencing of dry and wet weather conditions by the Treatment Adviser provides for activated sludge for aerobic biological treatment. Screening is incorporated at the Limbe plant. This process is not there at Municipal Case 1 in Sri Lanka. Screening is necessary in developing countries because of the nature and quantity of solids present in sewage, which include still born babies, maize cobs and pieces of cloth used for anal cleaning, and domestic garbage. Biochemical oxygen demand (BOD₅), chemical oxygen demand (COD), and total dissolved solids (TSS) removal efficiency in the dry season was 93%, 40% and 93%, respectively. The study further established that the BOD₅, COD and TSS removal efficiency in the wet season was 92%, 5% and 20%, respectively. BOD₅, COD and TSS removal efficiency at the plant in Sri Lanka was 83%, 76% and 77%, respectively. The close correlation in the treatment processes at Municipal Case 1 in Sri Lanka, the suggested dry and wet season unit treatment processes according to the Treatment Adviser, and the actual set up at Limbe WWTW confirms the practical use of CBD and CBR principles in the ED-WAVE tool in the design of wastewater treatment systems.

Keywords: Aerobic biological treatment; Case-based design; Grit removal; Humus tank; Imhoff tank; Unit treatment processes

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