LABORATARY SCALE STUDIES ON TREATMENT OF WASTEWATER FROM VEHICLE SERVICE STATIONS

D. R . I. B. WERELLAGAMA, S. N. T. BASNAYAKE,
W. M. C. L. B. WICKRAMASINGHE AND Y. M. C. N. YAPA

Department of Civil Engineering, Faculty of Engineering, University of Peradeniya

In many parts of Sri Lanka there is a problem of water and land pollution due to the effluents of vehicle service stations. This effluent comprises spent engine oil, lubricants, other oils, and detergents, that are washed away from the vehicles during body wash and cleaning under carriage. The objective of the present research was to find a practical and cost-effective effluent treatment solution suitable for Sri Lanka. In the first phase of the project, the common constituents of the service station discharge wastewater were identified. The concentrations observed were Color over 500 PtCo units, Turbidity 60 NTU, Conductivity over 70 mS/m, Suspended Solids (SS) over 160 mg/L, pH 7.5 and COD in the range of 4000 mg/L. The treatment methodology was identified as screening, sedimentation, oil-water separation, and filtration with the aim of reuse of water in the service station.

Wastewater for the studies was obtained from the Eriyagama service station. The laboratory model was run at the service station itself. Soxhet apparatus was used to separate and quantify the amount of oils as specified in the Standard Methods. Graduated cylinders were used as standing columns, and Atomic Absorption Spectrometry (AA) was used for analysis of the presence of metals. The wastewater samples were allowed to remain in Standing Columns up to 96 hours. In 30 minutes approximately 15.6% by volume of SS had settled, and in 24 hours this amount was 16.9%. The volume of oil separated was 18.8% in 30 minutes and 19.4 % in 24 hours. This showed that a detention time of the order of one hour could remove more than 90% of the total amount removable. Therefore, a detention time of one hour was adopted for the laboratory scale model. Even after 96 hours of settling, there was still some turbidity present. Therefore, a filtration step was adopted to treat oil-skimmed water, to ensure reuse quality of the treated water.

In the laboratory scale study (at the service station) wastewater flowed in 3 settling tanks in series followed by a Filter. The removal amounts in three tanks were observed with time. In the filtration tank, measurements showed the reductions of Color (90%), turbidity (72%), SS (60%) and conductivity (57%). pH of the effluent showed a slightly acidic tendency, yet within the allowable region. The filter effluent analysis by AAS showed high Na and Mg, and low Cu and Zn. Media tested were sea sand of effective size 0.35 mm, River sand 0.45 mm, Laterite 5-15 mm, Broken bricks 10-15 mm, Broken tiles 5-10 mm and Metal 5-10 mm. 7 combinations of these sand media were used.

Identified treatment train is (3 Nos.) sedimentation cum oil separation tanks in series, with 20 minutes detention in each tank and filtration using laterite and sea sand as dual-media. The treated Wastewater can be reused for operations like cleaning under carriage. The oil recovered in the oil-water separation step can be sold (in Sri Lanka) for use in brass industry and as a wood preservative. The oily clay remaining at the bottom, of the tanks is suggested to be used in the roof tile industry as a substitute for mould oil.