

BI 06 Selection of optimum filter media configuration to improve the efficiency of pebble matrix filters (PMF)

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The Pebble Matrix Filtration (PMF) is a non-chemical, sustainable pretreatment method to protect slow sand filters from high turbidity during heavy monsoon seasons in tropical countries. The first full-scale PMF unit in Sri Lanka has been constructed in the water treatment plant, Kataragama. Unexpectedly, high filtrate turbidity have been noted which has badly affected the quality of water. Hence the objective of this research was to investigate an optimum filter media configuration for PMF in order to improve its treatment efficiency. Laboratory scale filter consisted of three distinct layers. The bottom layer of 60 mm depth acted as a support for the filter bed. The middle and top layers formed the filter bed. The middle layer consisted with pebbles and sand into different ratios. The top layer consisted of only pebbles. Twelve experimental series were conducted so that there were two experimental series for each of six different configurations of the pebble-sand mixed bed. The selected mean diameters were 7.2 mm, 11.6 mm and 20.0 mm. Pebbles of each mean diameter was mixed with sand into 3:2 and 1:1 ratios (pebbles:sand). The influent was fixed into 60 NTU in all experimental series. While the filter was being operated for 2.5 hrs, the effluent turbidity was measured at every ten minutes. The configuration that gave the highest turbidity removal was selected as the optimum configuration. The configuration which consists of pebbles with the lowest mean diameter (7.2 mm) and pebble: sand ratio of 1:1 in the pebble- sand mixed bed gave the highest efficiency of 90%. The efficiency increased with the increase of the sand proportion in the pebble-sand mixed bed. It can be concluded that the efficiency of the PMF increases when the mean diameter of pebbles in filter media is decreased and the sand proportion in the pebble-sand mix bed is increased together.

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