Determination of head loss progress in dual-media BOPS-sand filter using numerical modeling incorporated with matrix approach

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ABSTRACT

Rapid filtration is a well-known method in treating raw water for municipal water supplies. Burned oil palm shell (BOPS) was considered as a new potential filter media produced from oil palm shell. The filtration unit constructed consists of a mono-media filter of BOPS and sand as well as a dual-media filter of BOPS-sand. Effective size (ES) of BOPS media was specified at 0.6, 0.8 and 1.0 mm, whilst sand was 0.5 mm. Filtration process was run by passing through the synthetic raw water at two different flow rates of 3.62 m/h and 5.81 m/h. The effluent water quality in terms of total suspended solids removal is dependent on both filtration flow rate and effective sizes of granular media. The higher the flow rate and the higher the effective sizes of granular media produced, the lower the total suspended solids removal. The dual-media filter with ES of 0.8–1.0 mm for BOPS and 0.5 mm for sand at flow rates between 3.6–5.8 m/h was found to be the most appropriate combinations in resulting a high quality effluent, longer operation time as well as a balance head loss pattern for both BOPS and sand layers.

Keywords: Head loss; Dual-media filter; Matrix approach; BOPS; Sand

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