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APPLICABILITY OF COCONUT SHELL-BASED GRANULAR ACTIVATED CARBON (GAC) FILTER MEDIA TO TREAT REVERSE OSMOSIS (RO) EFFLUENT WATER

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Abstract

Direct discharge of Reverse Osmosis (RO) effluent water poses a significant environmental impact, thereby its manipulation is of utmost importance. In Sri Lanka currently, RO effluent is directly discharged into the environment. Thus, a cost-effective and environmentally friendly RO effluent treatment is mandatory. The study aims at assessing the applicability of a coconut shell-based Granular Activated Carbon (GAC) to treat the RO effluent prior to discharge into the environment. A filter apparatus was designed with a column containing a coconut shell-based GAC of particle diameter range 1.18-2.36 mm. The required standard flow rate of 7 mL per minute was maintained via the GAC column. RO effluent was passed through the pre-conditioned GAC column, and the filtrate was collected. By repeating the protocol, the filtrate collection was triplicated. Six equal setups were arranged using six selected RO effluent samples, and the filtrates were analyzed for selected water quality parameters. After passing through the GAC column, a reduction of concentrations of nitrate (50.41%), Total Phosphate (TP) (38.16%) and COD (100%) was recorded. Furthermore, the concentrations of Na^+, K^+, Ca^{2+}, Mg^{2+}, Cd^{2+}, Cr^{3+} and F^- were also reduced by 100, 82.44, 86.43, 82.79, 100, 100 and 69.49% respectively. Since nitrite and ammonia were not in the detection limits in the original samples, a remarkable change was not observed after the treatment with GAC, whereas the reduction percentage of EC values recorded 21.59%. In agreement with the results, the GAC filter designed in the current study was efficient in diminishing most of the inorganic and metal ions in RO effluent water. Thus, this design can be recommended with further modifications to be incorporated in the RO process to address the future burden of RO effluent.

Keywords: Reverse Osmosis (RO), RO effluent, treatment, Granular Activated Carbon (GAC), filter design