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Design of A Modular Filtration-Adsorption System for Removal of Methylene Blue and Turbidity using Activated Carbons and A Sand-Gravel-Anthracite Filter

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Abstract : The presence of methylene blue (MB) and turbidity in water bodies resulting from industrial effluents and urban runoffs cause concern due to their harmful effects on health. Therefore, the present research developed and analyzed the design of a continuous modular plant for water treatment through adsorption and filtration operations for use in the removal of methylene blue and bentonite, respectively, using sand, gravel and anthracite filter media and activated carbon as adsorbent media. The different operating variables of the processes by means of accessories such as valves and flow calibrators and the models that best fitted the optimal operation of the plant were determined. The most influential design parameters were found to be length, column diameter and flow rate. In the adsorption tests it was obtained that the most influential parameter is the filling height, establishing the response surface methodology the optimal adsorption conditions efficiently, adjusting the experimental data to the Yoon-Nelson model with R2=0.97 with a removal percentage R (%) =79.74%. The most influential parameter in filtration was the stratification of the bed, proving that the rapid filtration rate with the filling height conditions in the established range significantly influences, with Deb's equation being the one that best adjusts the dynamic behavior of this process with R^2=0.98 and a removal percentage of 95.82%. The use of a modular filtration-adsorption system for removal of methylene blue and turbidity using activated carbons and a sand-gravel-anthracite filter, respectively, is an economical alternative to conventional water treatments.

Keywords : Methylene blue, bentonite, Yoon-Nelson model, Deb equation.

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