WATER QUALITY INDEX AND FILTRATION FROM ACTIVATED CARBON USING OIL PALM – EMPTY FRUIT BUNCHES

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ABSTRACT

Activated carbons are widely studied popular products due to their unique characteristics applicable for various purposes in many industries. Researchers from different fields utilized diverse biomass as precursor materials in producing activated carbons. Oil palm plantations yield one of the most abundant materials in certain countries and areas with large plantations. These materials, unfortunately, caused main disposal problems. This study used oil palm empty fruit bunches as a precursor material for activated charcoal production, aiming to improve the water quality index of a selected water resource. The researchers pre-tested two prepared water samples and then post-tested after filtration using OP-EFB based AC. The value of electrical conductivity and total dissolved solids for both water samples increased after filtration. The pH in sample A rose from 6 to 7 but remained 6.5 for sample B. The researchers detected the presence of crystalized $CaCl_2$ in the materials, which contaminated the water sample after filtration.

INTRODUCTION

Activated carbon is one of the most widely used materials in different fields, coming with various uses. Activated carbons are typical materials derived from charcoal done through the activation process where oil palm is one of those materials used as sustainable alternative resource. The abundance of such materials in specific countries could potentially apply in various ways that boost the economy rather than disposing of them; it is unusable and not environmentally friendly.

This research will primarily focus on the usage of oil palm wastes, specifically empty fruit bunches (EFB), as the precursor material in the production of activated carbons and activated chemically by using calcium chloride. This study is anchored with the United Nations Development Programme (UNDP) Sustainable Developmental Goals 6 Clean Water and Sanitation and 13 Climate Action.

RESEARCH METHODS

$$\text{Scope} \quad F_1 = \left(\frac{N \text{ of failed parameters}}{\sum N \text{ of parameters}} \right) x100$$

$$\text{Frequency} \quad F_2 = \left(\frac{N \text{ of failed tests}}{\sum N \text{ of tests}} \right) x100$$

$$\text{Amplitude} \quad excursion_a = \left(\frac{Failed\ Test\ Value}{Objective} \right) - 1$$

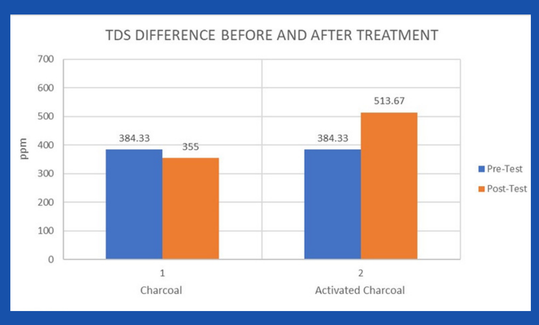
$$excursion_b = \left(\frac{Objective}{Failed\ Test\ Value} \right) - 1$$

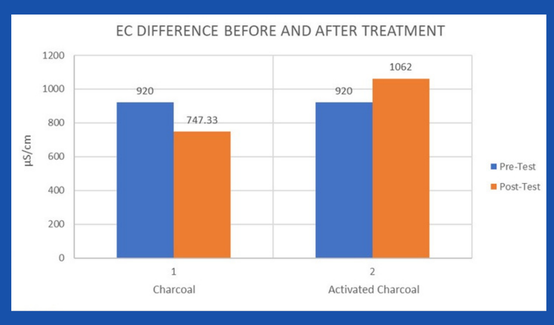
$$nse = \frac{\sum_{i=1}^{n} excursion}{N \text{ of tests}}$$

$$F_3 = \left(\frac{nse}{0.01nse + 0.01} \right)$$

$$\text{CCME WQI} = 100 - \left(\frac{\sqrt{F_1^{\,2} + F_2^{\,2} + F_3^{\,2}}}{1.732} \right)$$

RESULTS AND DISCUSSION





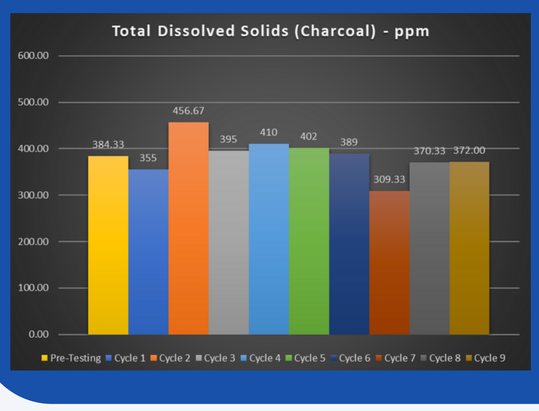
WATER QUALITY INDEX

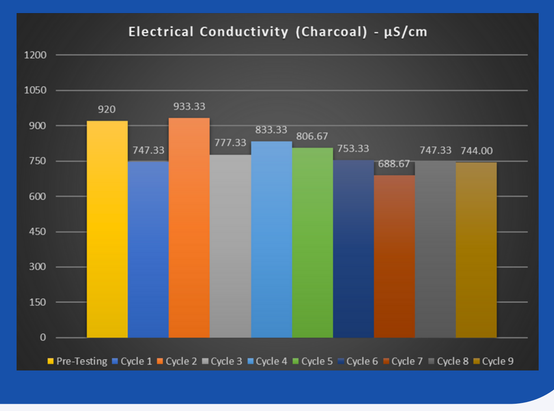
Pre – test

SAMPLE	Scope (F1)	Frequency (F2)	Amplitude (F3)	WQI
CONTROL	15.4	15.4	60.94	63
EXPERIMENTAL	15.4	15.4	60.94	63

Post – test

SAMPLE	Scope (F1)	Frequency (F2)	Amplitude (F3)	WQI
CONTROL	15.4	15.4	60.94	63
EXPERIMENTAL	15.4	15.4	61.24	62





CONCLUSION

Experimental results state that OPW – EFB non – activated charcoal works best in removing contaminants from water resources based from post – test results of EC – TDS, but no changes in the water quality index. It shows that activated OPW – EFB charcoal allows the decrease of water quality index but does not indicate positive results on EC – TDS and 11 contaminant parameters test, but both samples fall within marginal water quality. In terms of reusability, both materials are not viability to be used repeatedly, causing chloride contamination in cyclic filtration.

Using non – activated OPW – EFB charcoal works best in removing water contaminants than the activated OPW – EFB charcoal in terms of EC – TDS and 13 contaminant parameter tests, but both OPW – EFB charcoals yield similar water quality index within the marginal quality index after cyclic filtration.

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