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PALM KERNEL SHELL ACTIVATED CARBON FOR WASTEWATER TREATMENT: A CONTINUOUS ADSORPTION SYSTEM

Improve Mills' Profitability While Greening Our Wastewater

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NOVELTY / HIGHLIGHTS

- Activated carbon palm kernel shell (AC-PKS) was used as adsorbing material
- Packed in a continuous adsorption system
- Performed superior than the conventional packed material (coconut shell)
- Cost AC-PKS (RM 6.70/kg) vs AC-COCONUT SHELL (RM 7.60/kg) with 11.84% lower than AC-COCONUT SHELL price
- Proposed circular economy:

PROPERTY	AC-PALM KERNEL SHELL (% Removal)	AC-COCONUT SHELL (% Removal)
Biological oxygen demand (BOD_3,mg $litre^{-1}$)	84.72 ± 11.50	78.61 ± 13.81
Chemical oxygen demand (COD,mg $litre^{-1}$)	94.55 ± 19.00	71.00 ± 11.26
Suspended solods (SS, mg $litre^{-1}$)	91.85 ± 16.50	77.41± 33.50
Colour (ADM)	98.90 ± 17.00	89.80 ± 19,09
Ammoniacal nitrogen (AM, mg $litre^{-1}$)	99.90 ± 13.50	64.20 ± 23.33



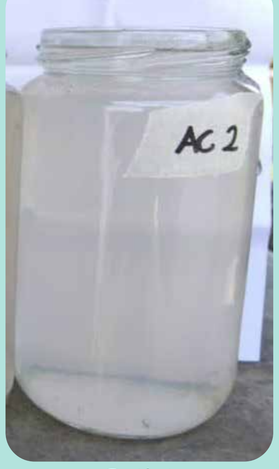
POME final discharge


Continuous adsorption system (5 m^3 hr^{-1}), Hydraulic retention time = 90 min

1) Spent AC as a potential usage (return to plantation as organic fertiliser)

Treated effluent discharged into river

2) Treated effluent as a potential water usage.



Outlet

ADVANTAGES

- Cheaper and abundant adsorption material
- Better adsorption efficiency
- Home grown technology

RECOMMENDATIONS FOR THE BEST RESULTS

- Use as final treatment system after membrane bioreactor (MBR), ultrafiltration (UF), *etc*
- Recycle of the treated effluent for backwash of sand filter and carbon column
- Return the spent AC to plantation as an organic fertiliser

ECONOMIC ANALYSIS

- Net present value (NPV) at 10% discount rate is RM216 836
- Profitability index (PI) is 1.62
- Internal rate of return (IRR) is 23%

With the cost to build the system of 50 m^3 hr^{-1} of RM350 000, the investment to adopt this technology is thus financially feasible.

Sawit ANUGERAH TUHAN