

# OIL PALM WASTE TO GREEN ENERGY : CO-TORREFIED OIL PALM PELLET (Co-TOPP)

INVENTOR: CHANG SIAW SANG  
 FACULTY: FACULTY OF CHEMICAL AND PROCESS ENGINEERING TECHNOLOGY  
 UNIVERSITY: UNIVERSITI MALAYSIA PAHANG  
 EMAIL: yayasiawsang@gmail.com  
 CO-INVENTORS: DR SURIYATI BINTI SALEH, ASSOC PROF DR NOOR ASMA FAZLI BIN ABDUL SAMAD



## Product Background

### Global Energy Consumption



4.26 Exajoules in Year 2019

- Ever-increasing energy consumption
- Depletion of fossil fuels
- Degradation of environments condition

### Oil Palm Solid Waste



47.81 Million Tonnes in Year 2017

- Major contributors of biomass waste
- High potential to replace fossil fuels
- Pre-treatment process to improve inferior properties

## Novelty/ Originality/ Inventiveness

- Combination of torrefaction and co-pelletization process on producing high quality biofuel pellets from oil palm solid waste.
- Blending different type of oil-palm solid waste to produce environmentally friendly pellets.

### Environmental Impact

- ↓ dependency on fossil fuel
- ↓ emission of CO<sub>2</sub>
- ↓ air pollution
- better utilization method

## State of the Art/ Methods



### Torrefaction

- Fixed Bed Reactor
- 20ml/min nitrogen flow
- 250°C
- Atmospheric Pressure



### Co-Pelletization

- Hot Press Machine
- 130°C
- 12MPa



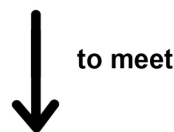
Co-TOPP

## Product Characteristics

- High Heating Value
- Low Ash Content
- High Hydrophobicity
- High Durability

## Marketability & Commercialisation

Torrefied Co-Pellet 18.5 MJ/kg vs Standard Wood Pellet 16.5 MJ/kg



Global Pellet Consumption by Year 2024 : 50 Million Tonnes  
 Malaysia Biomass Energy Generation by Year 2030 : 1340 MW

## Benefits/Usefulness/Applicability

Fungal Resistance & High Durability  
 Ease Storage & Ease Transportation



- application →
- Energy Generation
  - Gasification
  - Combustion

## Cost Analysis

Raw Material (RM/tonne)	0
Manufacturing (RM/tonne)	900
Shipping (RM/tonne)	750
Total Cost (RM/tonne)	1650
Selling Price (RM/tonne)	3000

Profit  
**RM 1350/tonne**

## Selling Price (RM/kg)

Co-TOPP		3.00
Charcoal		5.00
Fire Starter		21.00

## Achievement/Award Publication

- GOLD CITREX, 2020
- Development of Kinetics Model for Torrefaction of Empty Fruit Bunch from Palm Oil Waste. Energy Procedia, 105, 744–749,2017