Research

# Dr. Khairul Anuar produces CLINKROOF, sustainable green roof system based on palm oil waste

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PEKAN, 27 December 2022 - Flash floods and rising temperatures in big cities due to urban heat islands reported by the mass media are happening more and more often lately.

This situation has sparked an idea for the lecturer of the Faculty of Civil Engineering Technology (FTKA) UMP, Dr. Khairul Anuar Shahid to produce CLINKROOF that could reduce the potential for flash floods and lower the temperature in the building using solid waste from palm oil mills through green roof construction.

This project also received collaboration from FTKA lecturers, Dr. Noor Suraya Romali, Ts. Dr. Mohd Faizal Md. Jaafar, Ts. Roziah Zailan, Ts. Norhaiza Ghazali and Hasmanie Abd. Halim.

According to Dr. Khairul, the idea to create this product began when he visited a palm oil mill near UMP.

“The mill produces waste products from palm oil processing, namely oil palm clinkers, empty fruit bunches and palm oil mill effluents.

“It is produced based on several layer systems such as vegetative, substrate, filter, and drainage layers.

“All the layers except the vegetative layer use the waste from palm oil mills,” he said.

He further added that the vegetative layer is a layer for plants.

“All these layers will be built on the roof surface of the building and will be planted with creeping plants.

“The green roof can provide a cool effect inside and around the building.

“In addition, it can reduce the potential for flash floods in large urban areas that lack the soil surface to absorb water into the soil,” he said.

UNIVERSITI MALAYSIA PAHANG

ITEX'22

ITEX CATEGORY: BUILDING

# CLINKROOF

## THE SUSTAINABLE GREEN ROOF SYSTEM BASED ON PALM OIL WASTE PRODUCTS


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PATENT: PI2022002561




### Product Background:

i) Rapid urbanization has led to increase in loss of open space and forested land
ii) Global warming can cause temperature to increase at certain degree
iii) Increased in palm oil production led to increase in palm oil by-product

### Purpose of Invention:

i) Reduce flash flood in urban prone area
ii) Reduce energy consumption
iii) Reuse and recycle palm oil waste products

### Novelty/ Originality/ Inventiveness:

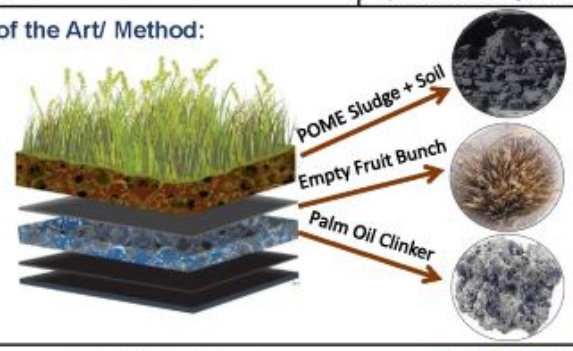
The CLINKROOF product replaced the conventional substrate, filter, drainage layer materials from soil, polypropylene, plastic to Palm Oil Mill Effluent (POME) sludge, palm oil empty fruit bunch (EFB), and palm oil clinker (POC)

### Product Benefits:

i) Improve run-off quality
ii) Good water absorbent, improved in infiltration system & organic fertilizer
iii) Reduce temperature & UHI impact



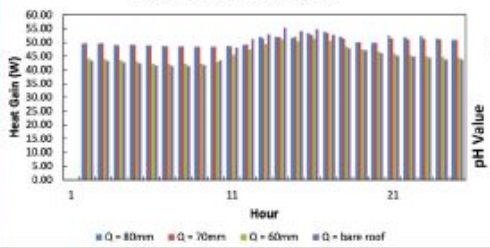
### State of the Art/ Method:

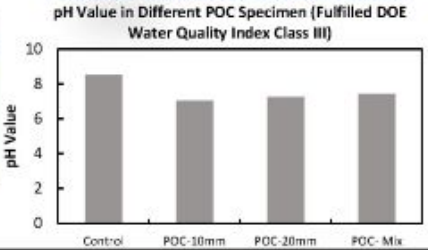


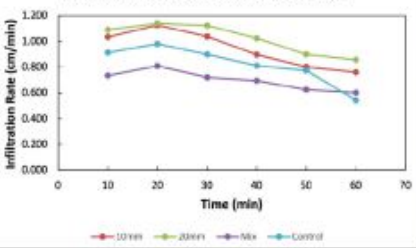

### Cost Analysis:

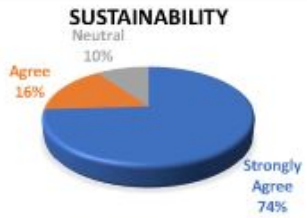
| Conventional Green Roof | | CLINKROOF | |
|---|---|---|---|
| Materials | Price (RM) | Materials | Price |
| 1. Garden soil | RM 30/m² | 1. Garden Soil | RM 30/m² |
| 2. Geotextile | RM 10/m² | 2. EFB | FREE |
| 3. Plastic Drainage | RM 5/m² | 3. POC | FREE |
| 4. Water proofing | RM 10/m² | 4. Water proofing | RM 10/m² |
| Total: | RM 55/m² | Total: | RM 40/m² |

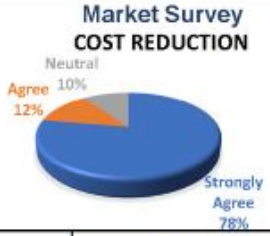
### Product Characteristics/Results

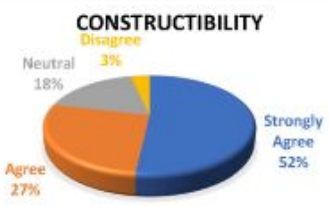



### Benefits/Environmental Impact:

Zero waste practice, clean and reduce landfilling
Reduction of Carbon emission and energy saving.

### Achievement/Award:

GOLD MEDAL CITREX, 2022

### Status of Innovation:

Prototype green roof system material & concept (TRL4)

### Collaboration/Industrial Partner:

NILAI BINA ENTERPRISE

SOLARVEST
Turning Sunlight Into Investment

### Marketability & Commercialisation

Commercialization potential for hotel's, apartment, university hall, convention centre and private house rooftop landscaping.

### Publication:


i) Compressive Strength of Concrete Containing Laterite Stone and Palm Oil Clinker as Fine Aggregate Replacement. In *IOP Conference Series: Earth and Environmental Science* (Vol. 682, No. 1, p. 012033). IOP Publishing (SCOPUS INDEXED)
ii) The potential of cooling effect using palm oil clinker as drainage layer in green roof system. *ARPN Journal of Engineering and Applied Sciences*, *11*(11) (SCOPUS INDEXED)
iii) Palm oil clinker as drainage layer in green roof system under Malaysia climatic conditions. *Journal of Engineering and Technology (JET)*, *5*(2), 27-38 (MYCITE INDEXED)

This research started in 2013 under the UMP internal grant and continued in 2021 because there is great potential to produce CLINKROOF in areas where flash floods are frequent such as Kuala Lumpur.

He added that the plan for this product is to continue with more in-depth research with partners from the industry to improve its function.

“This product has also been greatly improved in terms of functionality and construction.

“It is hoped that this product can be commercialised because it has a high potential to reduce the occurrence of flash floods, especially in urban areas densely populated with development and also has the potential to reduce temperatures within the area and its surrounding.

“The product cost is also much lower than those of conventional products because they are made from palm oil waste and indirectly contribute to environmental sustainability,” he said.

This research won a gold medal in the Creation, Innovation, Technology and Research Exposition (CITREx) 2021.

The research also won a gold medal at the International Invention, Innovation and Technology Exhibition (ITEX) 2022 which took place at the Kuala Lumpur Convention Centre (KLCC) on 26 and 27 May 2022.

**By: Nur Hartini Mohd Hatta, Corporate Communications Division, Chancellery Department**

**Translation by: Dr. Rozaimi Abu Samah, Engineering College/Faculty of Chemical and Process Engineering Technology**


- 174 views

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