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HY-KeFREC : HIGH PERFORMANCE OF HYBRID NATURAL FIBER REINFORCED COMPOSITES

PRODUCT DESCRIPTIONS

HY-KeFREC is a novel hybrid kenaf/glass fiber reinforced pultruded composite which could be used as an alternative material to conventional glass fiber composites, aluminium and steel in various light weight structural applications. HY-KeFREC offers high specific mechanical properties, low cost, lightweight, and environmentally friendly. Typically, HY-KeFREC was produced by sophisticated fabrication technique namely pultrusion process. This invention was mainly made by combination of Unsaturated Polyester Resin reinforced with hybridization of continuous kenaf and glass fiber with addition of filler: Calcium Carbonate (CaCO₃), surface additive (KOTE) and Catalyst: Benzoyl Peroxide (BPO), respectively.

PROBLEM STATEMENT

- Light weight issue**
 HY-KeFREC has a significant advantage over conventional glass fiber reinforced composites in terms of weight issue. Due to the implementation of kenaf fiber as reinforcement, it will significantly reduce the specific density of the composites without much scarifying the overall performances.
- Cost Issue**
 HY-KeFREC is an appropriate alternative candidate to replace synthetic fiber reinforced composites due to its cheaper price of raw materials. Moreover, the performance/cost characteristics of HY-KeFREC were experimentally proven to be almost equivalent with synthetic fiber reinforced composites.
- Sustainability Issue**
 The used of continuous kenaf fiber (natural resource) as hybrid reinforcement in HY-KeFREC had overcome the dilemma of sustainability for current composites products due to its renewable resources properties.

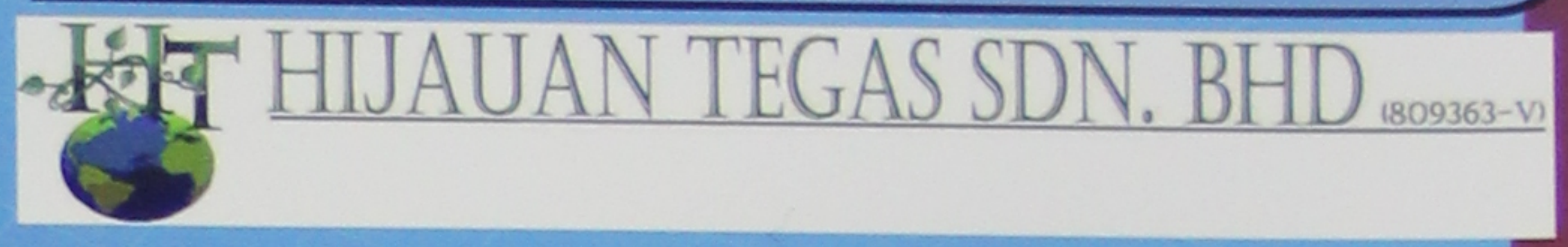
PRODUCT ADVANTAGES

- Light weight
- Lower cost
- Renewable
- Excellent strength to weight performances
- Sustainable product

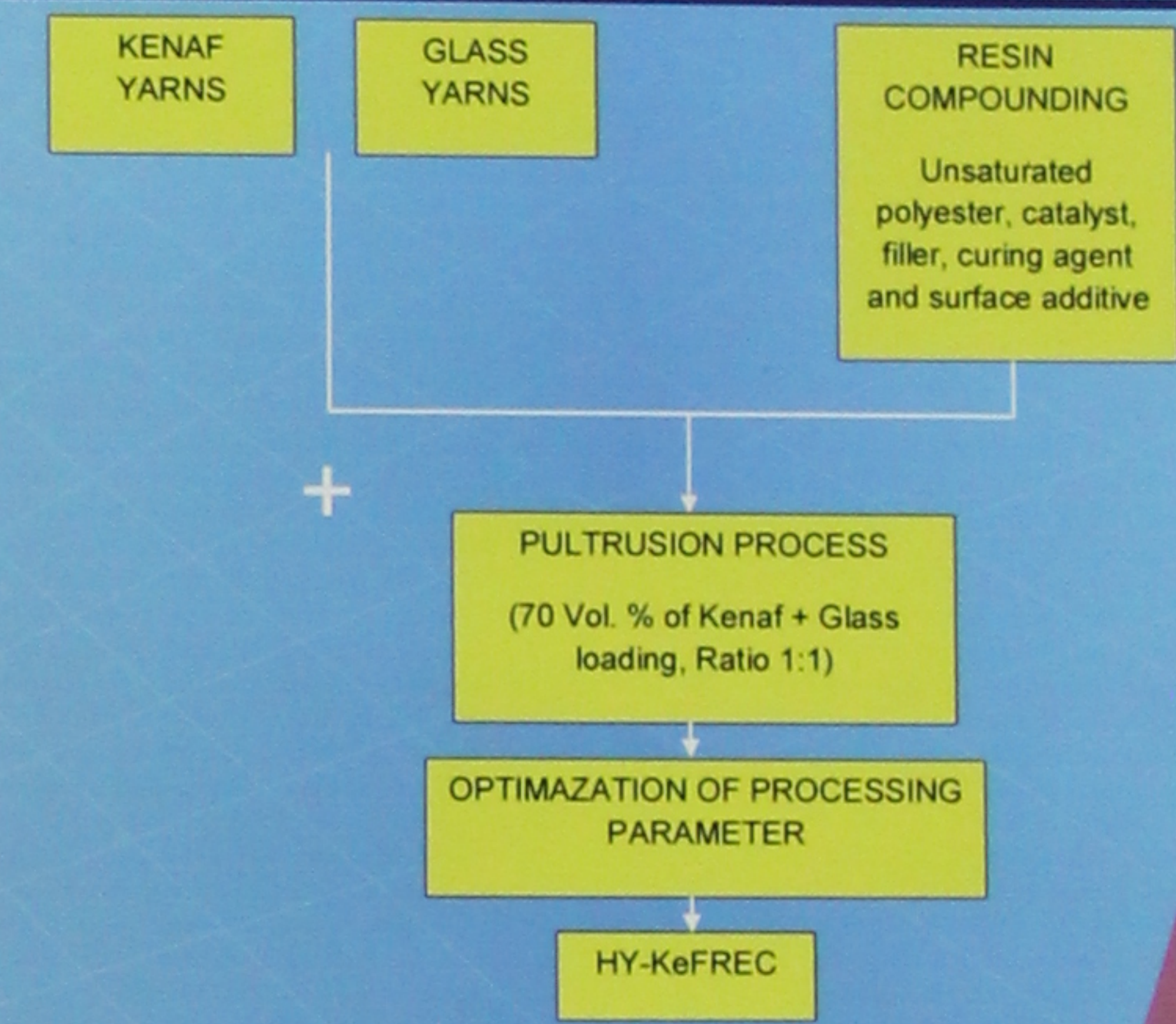
POTENTIAL APPLICATIONS



INDUSTRIAL PARTNER



MANUFACTURING FLOW



PRODUCT PERFORMANCES

Properties/Cost	GFRC	KFRC (70% vol. Kenaf loading)	HY-KEFREC (70% vol. Kenaf + Glass fiber loading)
Density (g/cm ³)	2.5	1.34	1.48
Specific tensile strength (MPa)/(g/cm ³)	120	44.78	113.51
Specific tensile modulus (GPa)/(g/cm ³)	5.25	4.78	5.54
Specific flexural strength (MPa)/(g/cm ³)	86	17.16	85.81
Specific flexural modulus (GPa)/(g/cm ³)	1.91	1.37	2.26
Recyclable	NO	YES	YES
Health risk when inhaled	HIGH	LOW	MEDIUM
Energy Consumption	HIGH	LOW	MEDIUM
Price estimation (Price per meter) (rod with 12 mm diameter)	RM 80-100	RM 20-30	RM 50-70

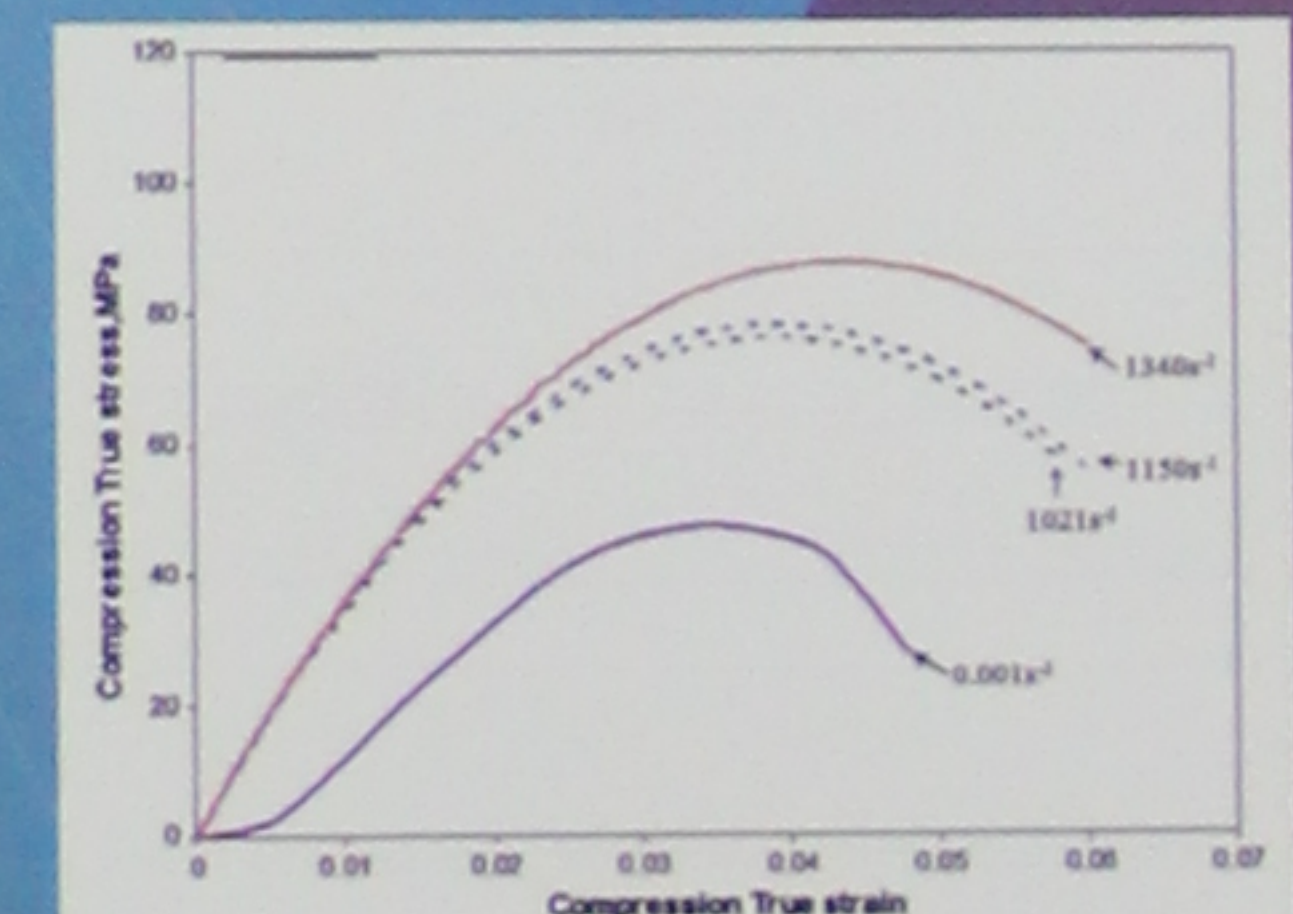


FIGURE 1: STATIC AND DYNAMIC MECHANICAL BEHAVIOUR OF HY-KeFREC

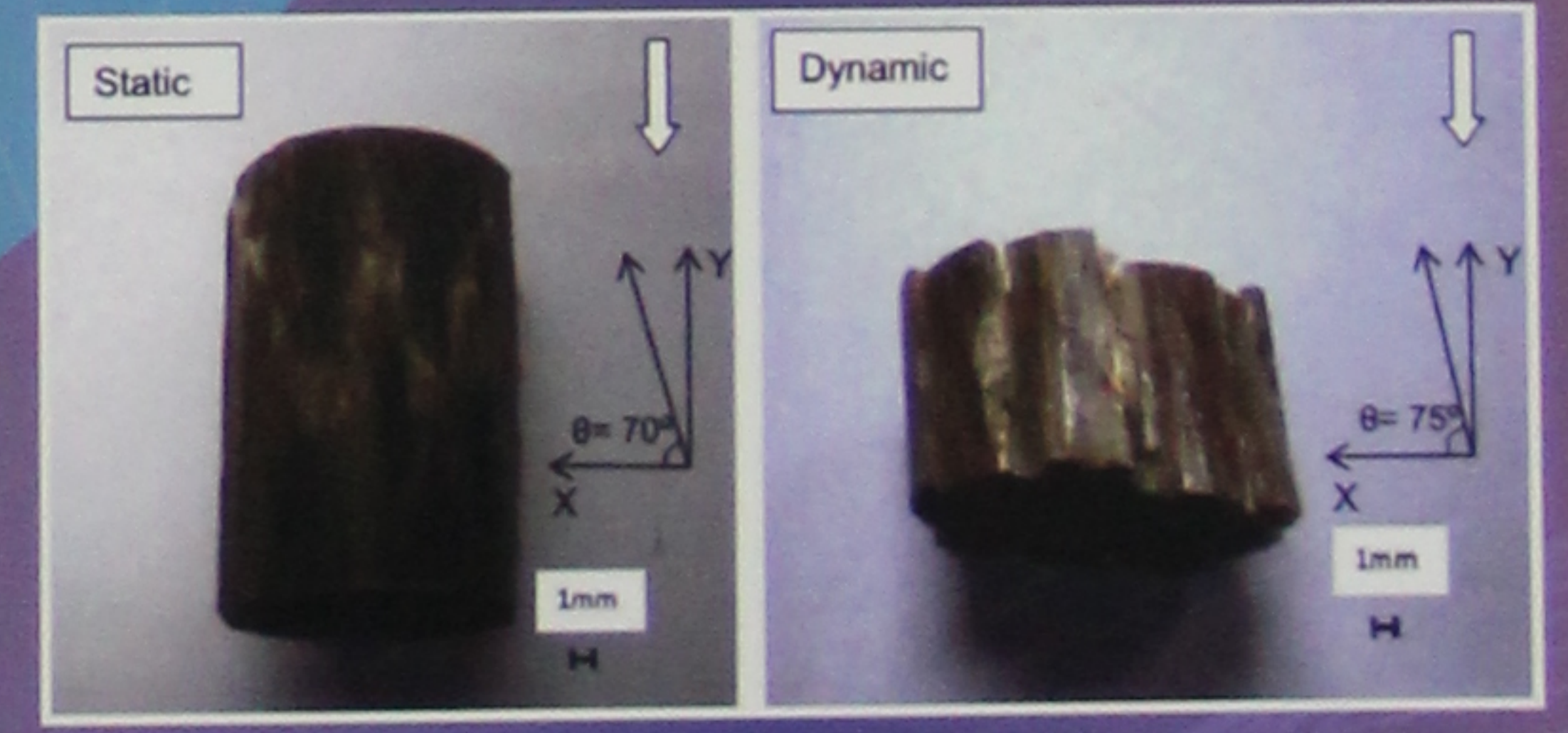


FIGURE 2: FAILURE CHARACTERISTIC OF HY-KeFREC UNDER STATIC AND DYNAMIC LOADINGS

PUBLICATION

- [1] Omar MF, Md Akil H, Ahmad ZA, Mazuki AAM, Yakayama T. Dynamic properties of pultruded natural fibre reinforced composites using Split Hopkinson Pressure Bar technique. *Materials & Design*. 2010;31:4209-18.
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- [4] Mazuki AAM, Akil HM, Sofiee S, Ithak ZAM, Bakar AA. Degradation of dynamic mechanical properties of pultruded kenaf fiber reinforced composites after immersion in various solutions. *Composites Part B: Engineering*. 2011;42:71-6.
- [5] Nasibi N, Akil HM, Mohd Ithak Z, Abu Bakar A. Degradation of compressive properties of pultruded kenaf fiber reinforced composites after immersion in various solutions. *Materials & Design*. 2010;31:4960-4.
- [6] Nasibi N, Akil HM, Ithak ZAM, Bakar AA. Behavior of kenaf fibers after immersion in several water conditions. *BioResources*. 2011;6:950-60.