

# Production of roof tiles manufactured from recycled plastics and sand

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# Order of Presentation

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- *Objectives*
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# Introduction

- There are many type of roofing materials presently in use including clay roof tiles, concrete roof tiles, metal panels, slate roof tiles, wood shake, shingles, and green roofs
- In Rwanda the mainly roofing materials used are from clay roofing tile, concrete roof tiles and also iron sheet
- To make the re-use of plastic waste and control pollution the present work “*manufacturing of roof tiles from recycled plastic waste and sand*” was done aiming at improving the technical and aesthetical properties of the final products. The main goal was to produce roof tiles that is of low cost and environmental friendly

# Objectives

- The Present study has been undertaken with the following objectives
  1. Adopt the existing model put on place for manufacturing roof tiles from recycled plastic waste and sand.
  2. Study water absorption and permeability of the roof tiles
  3. Compare the cost produced tile with the other roof materials

# Methodology

- **Raw material and formwork:** Plastic waste were collected from Nyagatare town while The clean sand not containing humus with the grain size distribution from 0–2 to 4 mm was obtained from Muvumba river
- The formwork was made local welding center (Agakiriro ka Nyagatare) in Nyagatare town.



## METHODOLOGY

- The following methodology was adopted:
- **Melting:** The plastic waste was crushed in the pieces to facilitate the casting and were placed in a drum and heated up to 220°C
- **Mixture of materials:** Plastic waste was liquefied, sand was added in the product. Two minutes were sufficient to mix liquefied plastic and sand
- **Molding:** The mixture was then discharged in the formwork, and coated by vegetable fat like oil, to facilitate easy withdraw from the formwork



Fig 2 Mixture in the formwork

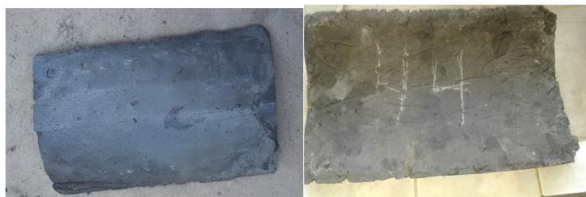
**Demolding:** After pouring the mixture in the formwork, the formwork is placed in cool air which allows to obtain a rigid roof tile with recycled plastic as binding material

## Test conducted to check resistance of the material

1. Water absorption test
2. Temperature resistance and adaptability

# Results and Discussions

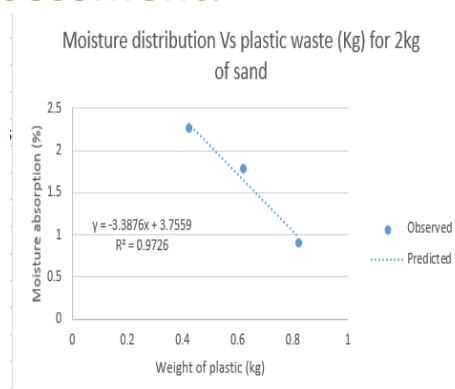
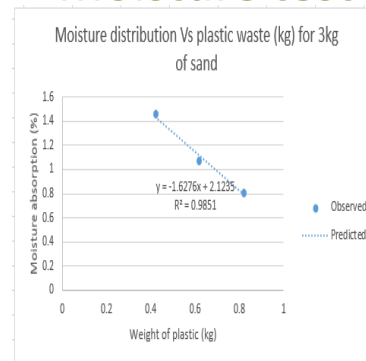
- The tiles produced was having a size of 250mm x 450mm x 7cm with weigh varied from 2.2 to 3.6kg based and the adopted size was 0.1125sq.m while compared the tiles manufactured from Rwanda Industries the weight varied from 1.2kg up to 3kg with the size less than 0.1125 sq.m



## Cost Comparison with existing tiles

Item	Ruliba roofing materials				Ion sheet	Plastic-sand made roof
	Mangalore tiles	Roman tiles round	Portuguese tiles	Roman tiles		
Dimensions/cm	44*25*4.6	43*16*7.5	41*23*7	37.5*18*7	300*90	45*25*6
Weight/kg	2.7	1.6	3.3	1.6	3.5	2.6 - 3.6
Numbers materials in 1 sq	15	36	15	36	0.4	9
Cost of sqm in RwFr	6,150	4,320	7,500	4,320	5,100	5522.4
Environmental impact	Quaring of clay damage the environment				Their waste cannot be recycled Increase	plastic waste are recycled and reused while ensuring environmental protection.

## Moisture test assessment:



Moisture absorption was increased as the quantity of plastic waste increased.

**Permeability test:** no drops of water observed after 2h as per IS hence the specimens were impermeable.

**Adaptability analysis:** The laboratory analysis shown that the tiles can melt from 200°C and melted completely at 220°C considering our temperature variation material can be used in Rwanda

**Cost estimation of roofing tiles:** Consider production cost, the price of tiles was estimated at 5525RwFr per sq.m but Compared to other tiles the manufactured roof tiles has an impact as they are reducing the plastic waste polluting environment and increase the income from local manufacturing industries

# Conclusion

The use of recycled plastic waste as binder to sand for roof tiles manufacturing gave satisfactory results, these roof tiles had allowable water absorption for roofing.

Consider that this is the first findings on the current material we would like to recommend the following:

- *As this was the first study on this product it was* recommended to go further for the current project in order to get a competitive product and very cheap which is not harmful for lives
- Different models have to be tested in order to produce appropriate products for Rwanda and East Africa.

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**THANK YOU**