# Manufacturing of floor tiles using plastic waste and agricultural waste

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## ABSTRACT

Floor tiles are the most common and widely used construction and building material around the world. Most of the plastic wastes are non-bio degradable and it takes a long time to deteriorate. Even though agricultural wastes are bio degradable, it also takes a longer period of time to degrade. As a solution for environmental pollution, it was decided to manufacture a floor tile using plastic wastes and agricultural wastes. For this research, rice husk and HDPE were selected as raw materials. By varying the weight ratios of rice husk, suitable floor tile samples were obtained which tallies with the standard floor tile properties.

**KEYWORDS:** floor tile, waste material, testing

## INTRODUCTION

It is known that plastic waste has become a growing disaster to environment as it adversely affects human, wildlife and wildlife habitat. Agricultural waste has also become a threat to the environment as it takes a long time to degrade. Nowadays the usage of tiles has become a tremendous upswing. The cost of tiles has increased due to the scarcity of materials such as marble chips, granite, sand, travertine and etc. which are used for tile manufacturing process. Manufacturing of construction and building materials using waste materials has become a new trend due to the technology. In this research, it is expected to manufacture floor tiles using plastic and agricultural wastes. As it will be a solution to the environment pollution as well as a solution for high cost in tile manufacturing.

As agricultural wastes rice husk, sugar cane bagasse, rice straw can be used. These are the agricultural wastes generated in many parts of the world like India, China, Cambodia & etc. As plastic wastes, most abundant things such as carrier bags, bottles used to put fruit juices, milk & water can be used. These are made from HDPE and LDPE. In this research we expect to manufacture floor tiles as a mixture of above waste materials.

The considered properties of floor tiles are abrasion resistance, chemical resistance, linear shrinkage, apparent density, water absorption and etc. When manufacturing floor tiles using wastes these properties should be considered. For that task testing of series of tile samples should be specified according to standards

such as PN_EN ISO 10545-7, ISO 10545-13, and ASTM C326 & ASTM C373 respectively. By testing the series of tile samples, the most suitable tile sample which tallies with the floor tile properties can be selected.

## METHODOLOGY

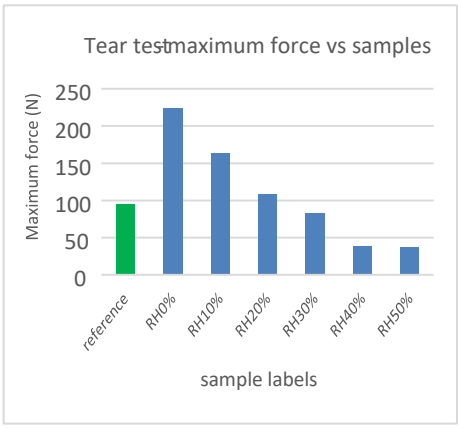
We prepared a series of tile samples by varying the weight ratio of HDPE and rice husk while keeping the temperature

and pressure of hot press at 160 $^0$C and 1000 psi respectively. The retention time inside the hot press was 15 minutes and in the cold press it was 10 minutes. The first tile sample was produced by adding both HDPE and rice husk at 50% weight ratios as it is the moderate composition. By getting the above sample, we were able to analyse that the extent of binding agent (HDPE) should be greater than the filling agent (Rice husk) to produce a proper tile. According to the above conclusion tile samples were produced by reducing the weight ratio of rice husk by 10% while keeping other parameters as constant. After developing the tile samples according to these conditions, it was required to test the samples in order to analyse with the actual properties of the floor tile. In here, as it was difficult to do the testing for the above developed products. It was required to make another thin sheet for the testing purpose. In order to make thin sheets, brabender plasticorder machine and compression mould were used. These thin sheet samples were made according to the rice husk weight ratios of 0%, 10%, 20%, 30%, 40% and 50% of the weight of the sample. The weight of the sample which can be made by the plasticorder machine is about 40 g. After making the thin sheet samples according to the weight ratios, it was required to cut the specimens to test for hardness, tear and tensile strength. These specimens were cut according to the testing requirements. By analysing the test results, it is required to select the most tallied tile sample and develop the product.

## RESULTS AND DISCUSSION.

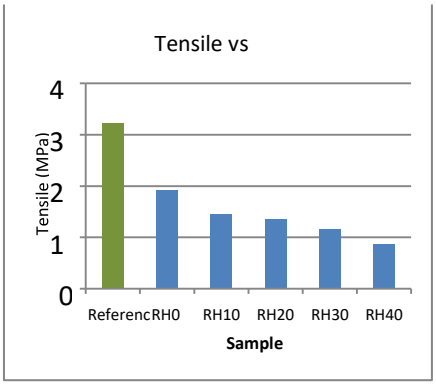
Tests for the tile samples were carried out. Following graphs were obtained in order to compare the results with the reference literature values.

**Tear test**



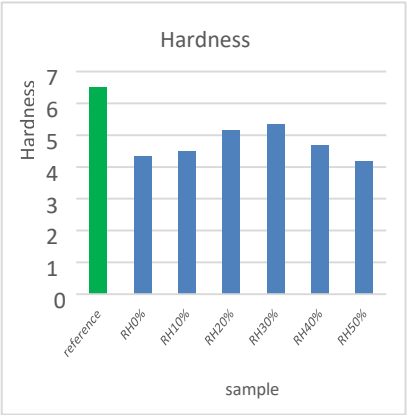

According to the above illustration the maximum force in the tear test which is nearly close to the reference value of 94.18 can be seen from the sample RH30% which has a rice husk percentage of 30 % and HDPE amount of 70 % from the weight of the sample. From above data it can be concluded that RH30% tallies with the reference value.

**Tensile test**




According to the graph, there no tile sample which tallies with the reference value.

**Hardness test**




From the above illustration, cannot predict a conclusion because in here variation of the values with the weight ratios is not in a relation. The difference of the values of the hardness test is not linear. When compared with the reference value of the hardness test the closest hardness value to that is given by the RH30% sample. But as the results are not in a descending or in an ascending order, the conclusion from the above test cannot be taken as to be accurate.

## CONCLUSION

It is known that plastic waste to the environment has become a growing disaster as it adversely affects human, wildlife and wildlife habitat. As well as agricultural waste also has become a threat to the environment as it takes a long time to degrade. Nowadays the usage of tiles has become a tremendous upswing. The cost of tiles has increased due to the scarcity of materials such as marble chips, granite, sand, travertine and etc. which are used for tile manufacturing process. Manufacturing of construction and building materials using waste materials has become a new trend due to the technology. In this research, it is expected to manufacture floor tiles using plastic and agricultural wastes. As it will be a solution to the environment pollution as well as a solution for high cost tile manufacturing. Therefore, as solutions for these issues, it was decided to manufacture a floor tile using plastic wastes and agricultural wastes. In here, plastic waste is acting as the binding agent while agricultural waste is the filling agent for the tile. For this research as the raw materials rice husk and HDPE are selected. By varying the weight ratios of rice husk suitable floor tile samples are obtained which tallies with the standard floor tile properties. From the obtained results it is seen that floor tile properties can be varied with weight ratios. According to the test results obtained from tensile, hardness and tear tests it is difficult conclude that any samples have the properties closer to the reference floor tile properties. As only one sample series was prepared according to the weight ratio and the tests were not done accurately it can be concluded that further improvements can be done by preparing more series of samples and more accurate testing.

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