Test Results of a Mortar Made of Crushed Rice Husk Used for Housing Walls*

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Abstract .– Rice husk is one of the most common organic wastes generated around the word, and in Ecuador this is not an exception. The aim of this work is to show field test results of an innovative mortar composed by rice husk, which has shown a similar thermal behavior to traditional mortar. Two different geographical locations of the Ecuadorian coast have been taken into account for this study, which have different weather conditions. A slightly better thermal performance, relative to the temperature and relative humidity, is achieved in both places where the mortar with rice husk is used. Therefore, rice husk can be used in the manufacture of mortars for house walls, and reduce its environmental impact on our ecosystems.

Keywords-- Temperature, Relative hmidity, Mortar, Rice husk.

I. INTRODUCTION

Rice husk is one of the most common organic wastes generated around the world [1]. Nowadays, it is found in large quantities in husking machines of rice, which is often burned, and frequently is thrown into rivers and estuaries, causing pollution and obstruction. This project intends to reduce the pollution generated for the husk rice wasted, using this waste in the manufacture of mortars for house walls.

The aim of this work is to demonstrate the applicability of the crushed rice husk in the mortar for plastering walls. Using this residual waste in the mortar, the thermal measurements are similar in comparison with the traditional one. Consequently, this proposed mortar contributes in an eco-friendly way with the nature.

II. METHODOLOGY

In previous research steps, physical tests on mortar samples with crushed rice husk were performed. Physical properties such as fluidity, compressive strength, hardening, and adhesivity were tested. Because of its characteristics, the sample coded as MCA1 was selected to built the prototypes in this proyect.

Five prototypes for test measurements were built in two different locations, Atahualpa and Laurel (parishes in Ecuadorian pacific coast). The prototypes were distributed according to Table 1.

TABLE I
DISTRIBUTION OF EXPERIMENTAL PROTOTYPES

	Prototype A	Prototype B	Prototype C
Atahualpa	1	1	1
Laurel	1	1	

Grey cells in Table 1 represents the prototypes where mortar MCA1 was used. Selected locations, i.e., Atahualpa and Laurel, are indicated in Fig. 1.

Data loggers and sensors in each prototype were set. The following array of sensors was deployed: four thermal sensors (one per wall), one thermal sensor in the central part to 1.5 m height, one thermal sensor and humidity sensor in the ceiling home. Therefore, six sensors for each prototype were employed. Moreover, the outside prototypes, a weather station was installed in order to measure variables such as: temperature, humidity, solar radiation, wind speed, wind direction and rainfall.

Fig. 1: Geographical location of the prototypes (Yellow dots). Image from google earth.

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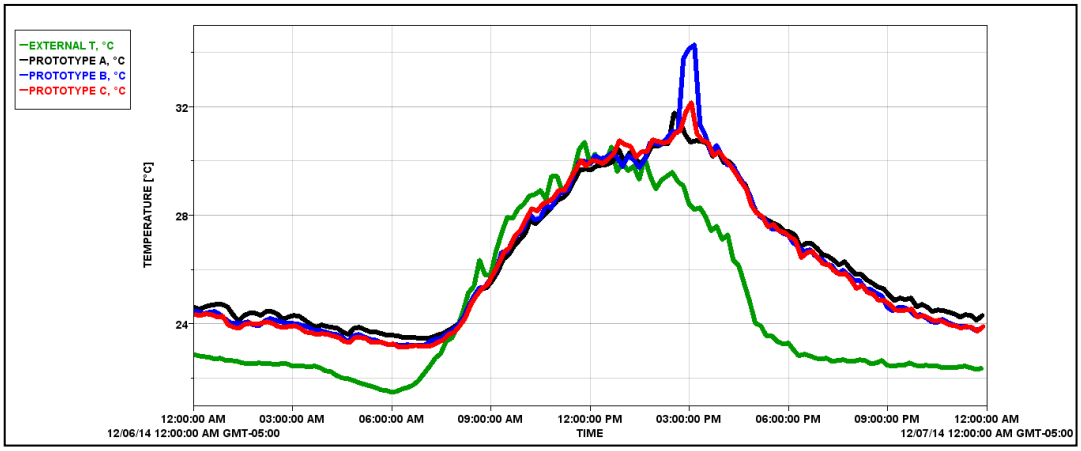

Fig. 2: Temperature comparison in Atahualpa. (December 6, 2014)

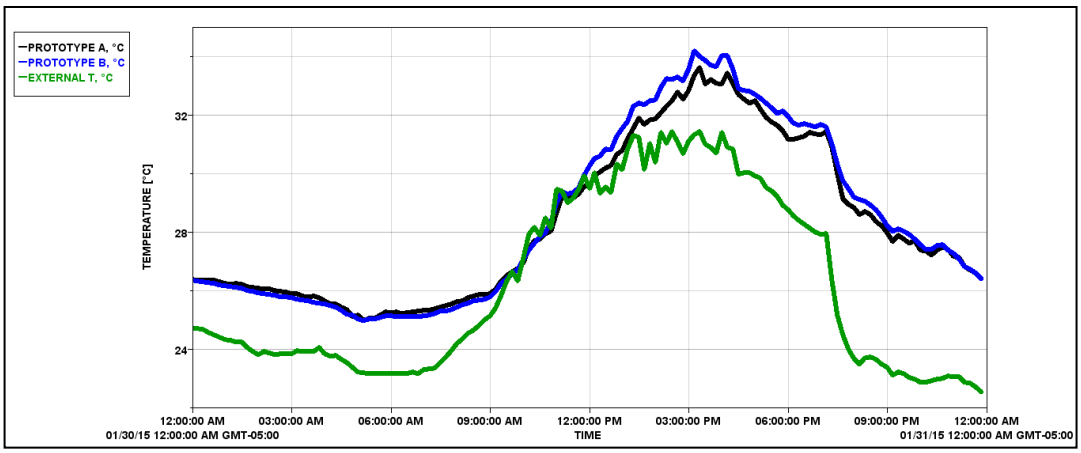

Fig. 3: Temperature comparison in Laurel (January 30, 2015)

Temperature and humidity as thermal parameters for establishing the comfort inside a house have been considered [2].

In both places, measurements were taken with thermal sensors for a moth as sampling. For this analysis, the time interval of the day with the highest radiance, temperature and relative humidity of the environment has been considered.

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III. Analysis and Discussion of Results

A. *Field Test in Atahualpa*

Fig. 2 shows a comparison between the temperatures of the environment and the indoor for each prototype. A slightly better thermal performance is evident in the prototype C compared to prototype A (fabricated using the traditional mortar). It is mainly due to the Prototype C was built with brick block. Whereas that the walls in Prototype B and C were pastered with mortar MCA1.

B. *Field Test in Laurel*

Observing Fig 3, similarity of thermal curves of the two prototypes during the early hours of the day and near noon can be noticed. However, during afternoon hours; prototype A (where the traditional mortar was used) shows no significant thermal behavior difference. Hence, MCA1 used in prototype B has acceptable performance.

IV. Conclusions

The test results show a thermal behavior similar to the expected if traditional mortar is used. The evidence from this study suggests that the mortar made of crushed rice husk represents a viable alternative and at the same time to face issues related to the overproduction of organic wastes.

References

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