Paper Pulp as an Effective Spare in Fly Ash Bricks

Arun Kumar T1*, V. Jayanthi1 and Ramasamy G2

1Department of Biochemistry, PSG College of Arts and Science, Coimbatore-641 014, Tamil Nadu, India
2Department of Civil Engineering, SNS College of Engineering, Coimbatore – 641 107, Tamil Nadu, India

*For correspondence E-mail: sakraut@gmail.com

Article Info: Received 27 Nov 2018; Revised: 28 Dec 2018; Accepted: 29 Dec 2018.

ABSTRACT

In this current scenario enormous amount of non-renewable sources is used by the construction industries. To keep up with maintainable development movements and increasing reasonable pressure in the industry, building materials in future have to lighter weight, more energy efficient and lower cost. Paper bricks are key structure materials for building in general and low cost housing in specific. The unbiased of this study is to develop light weight paper brick from paper pulp with tiniest cost. The paper pulp was poised, hydrated and gyrated to obtain slurry mixing with fly ash, lime and quarry dust and cast into shape. The tests were accompanied on bricks after drying and curing. Therefore these bricks will reduce the departed weight of the structure to the significant amount. So it changes our design and building cost as in cost-effective point of view.

Keywords: Renewable, paper pulp, design, compressive strength

1. INTRODUCTION

According to the research, more than 450 million tons of papers are produced every year. It is assessed that by 2020, paper mills will be creating 500 million tons of paper each year. Pulp and paper is the 3rd largest industrial polluted of air, water and soil. Since a large request placed on the building industry, especially in the last decade, due to the increasing population which causes a chronic shortage of building materials, the civil engineers have been challenged to convert industrial wastes to useful building and construction materials [1].

In general, wastes formed from pulp and paper industries belong to the cluster of organic wastes. They fall into two universal modules with regard to their physical state, viz. suspended and dissolved. Most effluent pollution problems arising from this waste result from the ejection of fairly coarse suspended matter poised largely of fiber and other organic debris. A large portion of this settle at low stream velocities, causing the usual problems connected with organic waste bonds [2].

This experimental study which investigates the potential use of waste papers for fabricating a low-cost and light weight composite brick as building material [3]. These substitute bricks were
made with papercrete. Physical and chemical properties of paper and cement vary significantly depending on many factors such as geographical location and industrial processes. Employments of paper pulp waste remains in block can spare the paper and create a “greener” blocks for development [4].

2. EXPERIMENTAL:

Materials: The raw materials used are as follows.

2.1. Paper pulp

Pulp is a lignocellulose fibrous material prepared by chemically or automatically extrication cellulose fibres from wood, fiber crops, waste paper, or rags. Raw resources of paper pulp collected from local paper mill Erode.

2.2. Flyash (Class F)

The smoldering of harder, more established anthracite and bituminous coal regularly creates Class F fly slag. These fly fiery remains pozzolanic in nature, and contain fewer than 20% lime (CaO). Having pozzolanic properties, the polished silica and alumina of Class F fly powder requires an establishing specialist, for example, Portland concrete, quicklime, or hydrated lime, with the nearness of water keeping in mind the end goal to respond and create cementsitious mixes.

2.3. Quarry dust

Quarry clean is a waste item created amid the devastating procedure which is utilized to concentrate stone. It is shake particles. At the point when enormous rocks break in to little parts for the development in quarries. It resembles sand however, generally dim in shading. It is mineral particles. The thickness of Quarry tidy is 1650 kg/m³.

2.4. Lime

Lime is an important binding material in building construction. It is basically Calcium oxide (CaO) in natural association with magnesium oxide (MgO). Lime reacts with fly ash at ordinary temperature and forms a Compound possessing cementsitious properties.

3. PREFORMULATION STUDIES

3.1. Mixing Process

Table 1. Details of composition

<table>
<thead>
<tr>
<th>Sample</th>
<th>Fly ash (%)</th>
<th>Paper Pulp (%)</th>
<th>Lime (%)</th>
<th>Quarry dust (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Std</td>
<td>60</td>
<td>0</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>S1</td>
<td>50</td>
<td>10</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>S2</td>
<td>40</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>S3</td>
<td>30</td>
<td>30</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 2. Compressive strength of bricks at 7th, 14th and 28th days for paper pulp with fly ash

<table>
<thead>
<tr>
<th>Sample</th>
<th>Compressive strength (N/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7 Days</td>
</tr>
<tr>
<td>STD</td>
<td>1.82</td>
</tr>
<tr>
<td>S1</td>
<td>1.37</td>
</tr>
<tr>
<td>S2</td>
<td>1.18</td>
</tr>
<tr>
<td>S3</td>
<td>1.12</td>
</tr>
</tbody>
</table>

3.2 Casting of Bricks

Casting of the paper bricks were done for a size of (230x100x90) mm. For the mentioned size the brick moulds were made and bricks of that specified size were casted. Oil was applied to the inner layers of the mould for lubrication purpose. The moulds were filled in layers with uniform manual compaction of 25 blows per layer. Once the casting is done the moulds were left to set for 2 to 3 minutes and then they were carefully demoulded [6].

3.3 Compressive Strength

Quality of a block is discovered by setting it in a pressure testing machine. It is packed till it breaks, the base squashing quality of block is 3.50 N/mm²[7].
3.4 Hardness

A block should oppose scratches against sharp things. Along these lines, for this test a sharp instrument or finger nail is utilized to make scratch on block. On the off chance that there is no scratch impact on block, it is said to be hard block [7].

3.5 Structure

To know the structure of block, pick one block arbitrarily from the gathering and break it. Watch the inward part of block plainly. It ought to be free from irregularities and homogeneous [7].

4. RESULTS AND DISCUSSION

4.1. Compression Test

The bricks were prepared and compressive strength was tested for all the ratios. For each ratio 3 samples were tested and average or mean value is taken for 7th, 14th, 28th days.

The paper bricks have elastic behavior and less brittleness, due to this structure was not fully collapsed, when the papercrète bricks fail at higher load only the outer faces cracked and peeled out.

4.1. Hardness

In this test, a scratch was made on block surfaces. This test was completed for all the three extents of block. While the scratch was made with the assistance of finger nail on the blocks, light impression was found on the surface of the stringy solid block. So these test outcomes those sinewy solid blocks are adequately hard.

4.2. Structure

We break a brick and closely examined its structure. It should be homogeneous, compact and free from any defects like holes, lumps etc.

5. CONCLUSION

Based on limited experimental investigations concerning compressive strength of brick, the following observations are made regarding the resistance of partially replaced paper pulp: Compressive strength decreases when there is an increase in proportion of paper pulp. Use of paper pulp in brick will solve the disposal problem; provides scale back value and manufacture a ‘greener’ Eco- friendly bricks for construction.

a) Environmental effects of wastes and disposal issues of wastes are reduced through this analysis.

b) This study helps in changing the non-valuable paper pulp into bricks and makes it valuable.

Conflicts of Interest

There are no conflicts of interest.

References


