International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 04 | Apr -2017 www.irjet.net p-ISSN: 2395-0072

UTILIZATION OF LIME SLUDGE IN MANUFACTURING SOIL BLOCKS

Thara P[1], Sneha S[2], Nishad N[3] ,Aiswaryalakshmi B[4],Dharsana S[5] & Annie Mathai[6]

[1,2,3,4,5]*Students, Dept. Of Civil Engineering, Ahalia school of Engineering and Technology, Palakkad, Kerala*
[6]*Professor, Dept. of Civil Engineering, Ahalia school of Engineering and Technology, Palakkad, Kerala*

Abstract – *The project is designed for making soil blocks using lime sludge from industries manufacturing rubber yarns using natural rubber latex. Solid waste management is a major concern nowadays due to increasing number of industries. Recycling such wastes by utilizing them into building materials is a moderate solution for pollution issues. Thus this study explores the way of utilization of industrial waste in manufacturing soil blocks.*

Key Words: **Lime sludge, Stabilized soil blocks**

1.INTRODUCTION

Rubfila International Limited (RIL) is a Public Listed Company promoted by Rubpro Sdn. Bhd., Malaysia along with Kerala State Industrial Development Corporation (KSIDC) and has been in operation since 1994.It, manufactures Heat Resistant Latex Rubber Threads in India, as well as adhesives for production of footwear and leather goods. The industrial waste is treated with lime to form lime sludge. It act as good binder. Therefore this sludge is utilized in manufacturing soil blocks for building construction. This approach of manufacturing soil blocks making from waste is useful to provide potential and sustainable solution.

2.OBJECTIVES

The objectives of study are

- To determine the engineering properties of soil chosen for making blocks
- To study the performance characteristics of soil blocks prepared with varied contents of lime sludge.

3.MATERIALS

The soil used for making blocks was collected locally, and lime sludge from RUBFILA INTERNATIONAL LTD located at Kanjikode ,Palakkad, manufacturing rubber yarns using natural rubber latex. The components of lime sludge obtained from the industry along with its permissible limits are indicated in Table 1. A view of the sludge collected is shown in figure 1.

Table - 1: Material Characterization

ELEMENT	CONCENTRATION (mg/Kg)	LIMIT (mg/Kg)
Chromium	6.4	50
Nickel	36.4	5000
Manganese	171	5000
Lead	26.4	5000
Cadmium	6.6	50
Iron	9.2	Not specified
Magnesium	29000	Not specified

Figure - 1: View of sludge

4.METHODOLOGY

The sludge collected from Effluent Treatment Plant (ETP) was kept for air drying for a week and was then moved for oven drying for a period of 24 hours. This dried sludge was then powdered using Los Angeles Abrasion testing machine. The soil was collected locally and was kept for air drying for 24 hours. The soil was then taken to Geotechnical Laboratory and various test like Specific gravity test using pycnometer, Particle size distribution by sieve analysis, Compaction test were done for determining the engineering properties. The optimum moisture contents (OMC) for varying sludge content were determined .Eight blocks each ,with sludge contents of 0%,2%,6%10%14% and 18% were prepared.

Manufacturing of soil blocks can be done either manually or mechanically. For mass production of blocks, mechanical methods are preferred. All the components of soil blocks are

mixed thoroughly in desired ratio by using suitable mixing machine. The mixed materials are moved to platform near brick pressing machine. Suitable mould size is selected according to the desired soil block size. Fix the selected mould in brick making machine. Mixed materials are moved to mould. The mixed materials are casted into block form by pressing the lever attached to the machine. Soil blocks are kept in air for 2 days and then are kept for curing. After 28 days of curing, soil blocks are kept for 2 weeks of air drying. Then, soil blocks are taken to laboratory for conducting various tests.

Following tests are conducted on block sample

1. Water Absorption test (as per is-3495(Part-2):1992
2. Compressibility test (as per IS-3495(Part-2):1992
3. Water Spray Erosion test
4. Drop test

5.RESULTS AND DISCUSSION

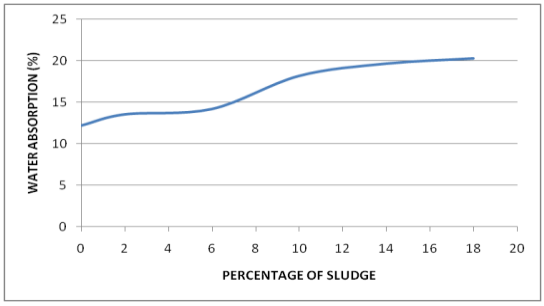

Chart – 1: Results of Water Absorption test

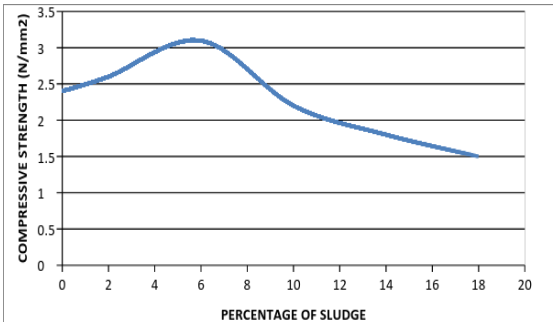

Chart - 2: Compressive strength v/s Sludge content

Figure 4: Results of Drop test

The results obtained from the detailed laboratory investigations are as follows. The optimum dosage of lime sludge to satisfy the specification of building block is found to be 6%. As per BIS, maximum permissible percentage of water absorption for soil blocks is 15%, the test shows that for soil blocks upto 6% sludge water absorption is less than the permissible limit. A maximum compressive strength of 3.1 $N/mm^2$is obtained for sludge content of 6%. On conducting drop test, the maximum drop height obtained was 80 cm for a sludge content of 6%. From spray test, it was observed that the soil blocks show least resistance to water spray. As percentage of sludge increases the resistance to water spay goes down.

6. CONCLUSIONS

The proposed method for manufacturing energy efficient soil blocks using sludge suggest a mean for waste disposal. The project mainly focuses on low cost alternative building material. Soil is replaced by lime sludge and quantity of cement used is very less. The study showed pulverized sludge added blocks leads to production of energy efficient soil blocks. Thus the concept of utilization of sludge from effluent treatment is accepted in production of soil blocks.

REFERENCES

[1] Alaa.A.Shakir, SivakumarNaganathan, Kamal Nasharuddin Bin Mustapha (2013), "Development of Bricks from Waste Material", Australian Journal of Basic and Applied Sciences, 7(8):812-818.

[2] Arora K R (2004) 7th edition, "Soil Mechanics and Foundation Engineering" , Standard Publishers Distributors.

[3] Balasubramanian J, P.C.Sabumon, John U. Lazar, R.Ilangovan (2006) "Reuse of textile effluent treatment plant sludge in building materials", Waste Management 26, 22-28.

[4] Chih-Huang Weng, Deng-Fong Lin, Pen-Chi Chiang (2003) "Utilization of sludge as brick materials", Advances in Environmental Research 679-685.

[5] Deepak Nayak, Purushotham G Sarvade, JagadeeshaPai B, Rangaswamy (2015) "Effect of Lime on Granite Dust

Stabilized Mud Blocks",4th World Conference on Applied Sciences,Engineering and Technology 24-26.

[6] Dhinesh.A, Karthikeyan.RI, Dinesh.S, Karthik.P.R, Karthick.S (2014) "Preliminary studies of common effluent treatment waste sludge in manufacturing of solid blocks", Scholars Journal of Engineering and Technology; 2(2A):161-167.

[7] IS 1077-1992 (Fifth Revision), Common burnt clay building bricks, specifications, Bureau of Indian Standards, New Delhi.

[8] IS 1725-1982 (First Revision), specifications for soil based blocks used in general building construction, Bureau of Indian Standards, New Delhi.

[9] IS 3495 (Part 1 and 2) 1976 (second revision) Method of test for burnt clay building bricks, Bureau of Indian Standards, New Delhi.

[10] NafsalKhaleel, T Ramasamy (2015) "The Use of Lime Sludge and Cement for Production of Green Brick", International on Applications in Civil and Environmental Engineering, volume 1, Issue 1.

[11] ShrikantS.Jahagirdar, S.Shrihari and B.Manu (2012) "Reuse of Textile Mill Sludge In Cement Based Solid Blocks", International Journal of Engineering and Research ISSN 0974-1518, volume.5 No.3, pp.213-224.

[12] ShrutakirtiA.Mahajan, Dr.M.Husain (2016) "Utilization of Waste Sludge in Brick Making", International conference on Global Trends in Engineering, Technology and Management (ICGTETM-2016).