ISSN XXXX XXXX © 2018 IJESC

Research Article Volume 8 Issue No.5

A Comparision Study on the Fesibility of FaL-G and QuFaL-G Bricks

Vellingiri Anusuya
Assistant Professor
Wolkite University, Ethiopia

Abstract:
Bricks for construction are prepared in the traditional from by burning the clay. Due to the expansion of occupation of the land leads to more number of constructions. This made an impact on the demand of bricks. Many numbers of researches and investigations were made on the preparation of bricks using various aggregates and industrial wastes. The industries produce different type of waste that can be recycled reused and reformed in to another material by mixing it. This paper deals with the comparison of such bricks made of such industrial waste. Bricks that are made of fly ash – lime – Gypsum (FaL-G) with a different mix ratios and Bricks that are made of Quarry dust – fly ash – lime – Gypsum (QuFaL-G) with a different mix ratios were taken in consideration. A number of such bricks of each type were prepared and subjected to various tests and the results are compared in this paper.

Keywords: waste, construction, bricks, Fal – G, QuFal – G

1. INTRODUCTION

Due to the demand of bricks for the construction in various aspects, situation has forced to increase the production of bricks with a nominal cost [1,2]. Bricks were prepared with various proportions and tested for the use of construction in various environments [3-5]. Different type of materials were mixed together to form bricks[7-9]. One among the idea is to prepare a sustainable and effective bricks from the industrial waste. The present trend is to effectively use the various industrial wastes for different applications. A lot of challenges are faced by the increased number of industries for waste disposal. With the findings of proper industrial waste that can be made effective in the preparation of bricks, led to the formation of bricks like fly ash – lime – Gypsum (FaL-G) and Quarry dust – fly ash – lime – Gypsum (QuFaL-G). Experimental studies on the feasibility of such bricks were carried out. This paper reveals the comparison study on the feasibility of both the bricks. Bricks that are made of fly ash – lime – Gypsum (FaL-G) with a mix of M1, M2, M3 and M4 [12]. Bricks that are made of Quarry dust – fly ash – lime – Gypsum (QuFaL-G) with a mix of M5, M6 and M7 [13]. Recommendations are made accordingly for the effective manufacturing and utilization of such kind of bricks that can be a good alternative for the clay bricks.

2. COMPARISION OF COMPRESSIVE STRENGTH OF FaL-G BRICK AND QuFaL-G BRICK

The first mix proportion M1 is selected from the FaL-G brick [12] and the other three mix proportions M5, M6 and M7 are chosen from QFaL-G brick [13]. The comparison between the compressive strength of Mixes M1, M5, M6 and M7 can be easily made with the help of the Fig.1

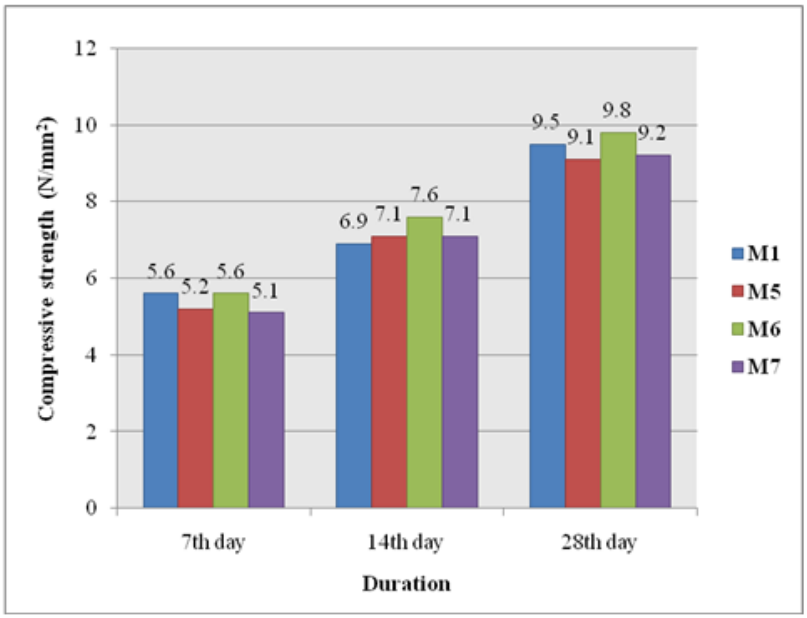

Figure.1. Compressive strength comparison between FaL-G Brick (M1) and QuFaL-G bricks (M5,M6,M7)

From the results, it is seen that the Compressive strength of all the mix proportions M1, M5, M6 and M7 are increasing with the increase in its age. When comparing the percentage of increase in compressive strength of the Mix M1 with M5, M6 and M7, it is observed that the growth of increase in strength for the mixes M5, M6 and M7 from 7th day to 14th day is 13%, 15% and 16% higher than the mix M1. But the growth of increase in strength for the mixes M5, M6 and M7 from 14th day to 28th day is 13%, 13% and 12% which is lower than mix M1. This indicates that the FaL-G brick gains its strength in a greater rate during the later stages but the QuFaL-G brick shows a greater strength development during the early stages and a slow gain in strength in its later stage. it is seen that the partial replacement of Quarry dust alters the growth of increase in strength of the FaL-G brick, but when compared to the increase in strength on the 28th day to 7th day, the mixes M5, M6 and M7 shows 5%, 6% and 14% higher increase in strength than mix M1. The maximum of 15% replacement of Quarry dust (M6) in the FaL-G brick gives the higher strength. From the observed results it is concluded that QuFaL-G bricks is recommended than FaL-G brick in the places where Quarry dust is available.

3. COMPARISION OF SULPHATE INTRUSION OF FaL-G BRICK AND QuFaL-G BRICK

The comparison between the compressive strength of Mixes M1, M5, M6 and M7 after subjected to sulphate attack can be easily studied with the help of the Fig 2.

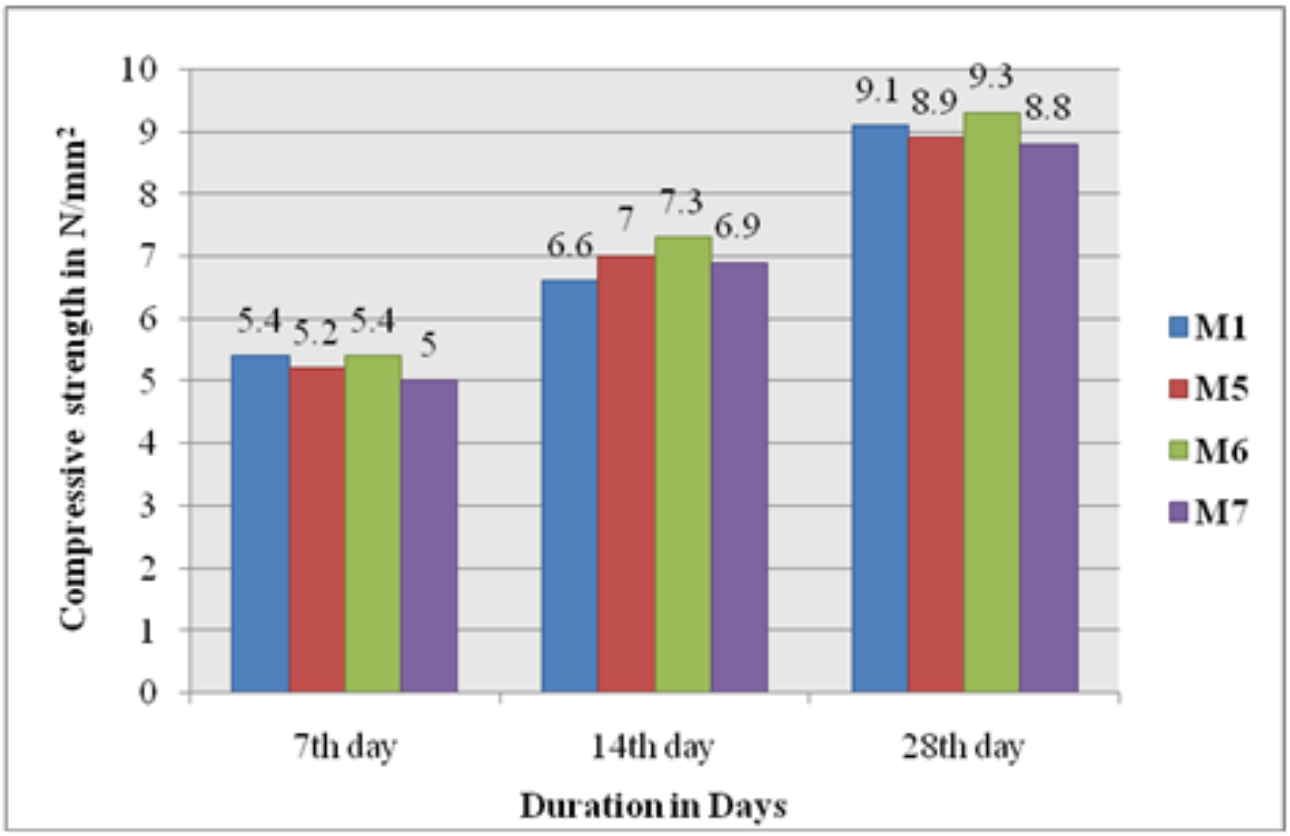

Figure.2. Comparison between FaL-G Brick (M1) and QuFaL-G bricks (M5, M6, M7) after sulphate intrusion

From the results, it can be seen that the Compressive strength of all the mix proportions M1, M5, M6 and M7 after sulphate intrusion are increasing with the increase in its age. When comparing the percentage of increase in compressive strength of the Mix M1 with M5, M6 and M7, it is observed that the growth of increase in strength for the mixes M5, M6 and M7 from 7th day to 14th day is 15%, 16% and 18% higher than the mix M1.

But the growth of increase in strength for the mixes M5, M6 and M7 from 14th day to 28th day is 13%, 14% and 12% lower than mix M1. This indicates that the FaL-G brick gains its strength in a greater rate during the later stages but the QuFaL-G brick shows a greater strength development during the early stages and a slow gain in strength in its later stage with sulphate. Under the sulphate attack, it is seen that the partial replacement of Quarry dust alters the growth of increase in strength of the FaL-G brick, but when compared to the increase in strength on the 28th day to 7th day, the mixes M5, M6 and M7 shows 2%, 3% and 7% higher increase in strength than mix M1. Hence it shows that 15% (Mix M6) replacement of Quarry dust in the FaL-G brick gives the ultimate strength after sulphate intrusion. Therefore it can be concluded that QuFaL-G bricks is recommended than FaL-G brick in the sulphate environment as the QuFaL-G brick gives more compressive strength. The QuFaL-G brick have more resistance to Sulphate intrusion as they have lesser water absorption when compared to FaL-G bricks.

4. COMPARISION OF WATER ABSORPTION OF FaL-G BRICK AND QuFaL-G BRICK

The Water absorption of Mixes M1, M5, M6 and M7 is compared and studied with the help of the Fig.3

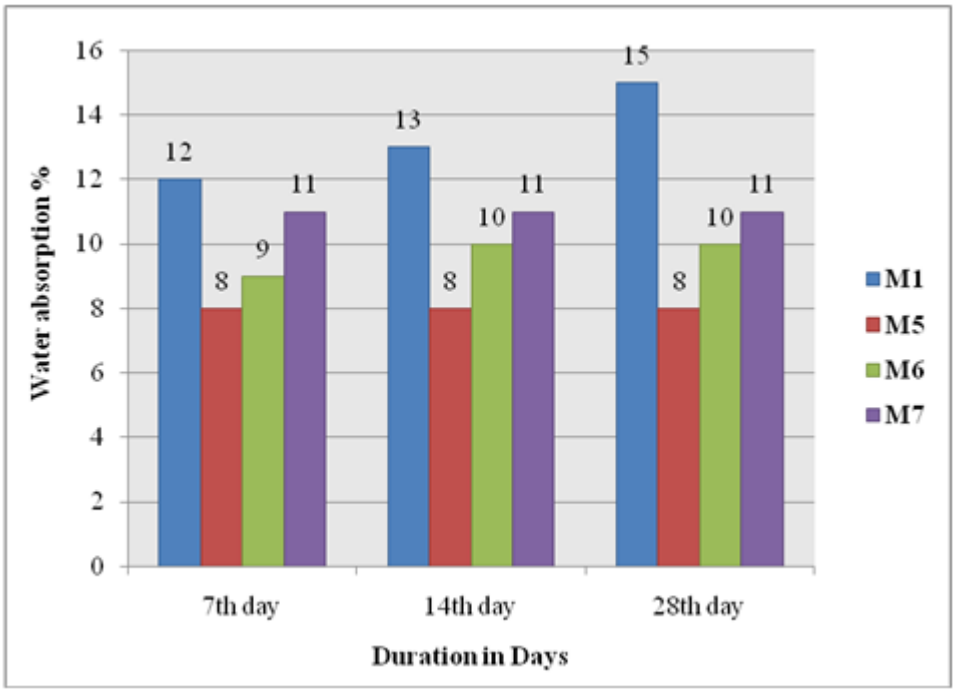

Figure.3. – Water absorption comparison between FaL-G brick (M1) and QuFaL-G bricks (M5, M6, M7)

As shown in the Fig.3 the water absorption of the mix ratio M1 on 7th, 14th and 28th is 12%, 13% and 15%. But the water absorption of the mixes M5, M6 and M7 were stabilised on 7th, 14th and 28th day at 8%, 9% and 11%. From this inference we can conclude that, with the decrease in fly-ash content the water absorption of the bricks increase with respect to the number of days. Further the addition of Quarry dust in the FaL-G brick decreases the air voids present inside them, hence it makes the brick denser. This reduction in air voids present inside the brick has a significant effect on reducing the water absorption. Therefore the QuFaL-G brick absorbs lesser water than FaL-G brick. Hence the QuFaL-G brick with low water absorption property is appreciably preferred to environments with high sulphate attack.

5. CONCLUSION

The present study is made to find the effective way of utilizing waste materials such as Fly-ash and Quarry dust in brick manufacturing. From the experiments conducted for this purpose, the following conclusions are suggested. It is observed that the FaL-G and QuFaL-G brick have a high compressive strength in the range of 8.8 to 9.5 N/mm^2 and 9.1 to 9.8 N/mm^2 respectively. Similarly, the bricks tested after sulphate intrusion shows a decrease in strength of about 0 to 4% and 4 to 8% only. However the strength is higher than normal conventional bricks. In the water absorption test conducted, the FaL-G brick QuFaL-G brick possess maximum water absorption of 16% and 11% respectively. It is lesser than the ordinary burnt clay brick. FaL-G and QuFaL-G bricks have better resistance to strong sulfate environments. These bricks can be moulded in to any shape and size depending upon the requirements similar to conventional brick. Hence the FaL-G and QuFaL-G brick are a good alternative and replacement for the burnt clay bricks. The FaL-G and QuFaL-G brick can successfully replace conventional burnt clay bricks in the construction work after carrying out the water absorption for longer duration and cyclic environment conditions.

6. REFERENCE

[1]. F.N. Spon, Alvaro Ortega, "Low cost building materials and technology" – International council for Building research studies and documentation, 2003, pp: 102-122.

[2]. K.S. Jagadish, B.V. Venkatrama reddy, K.S. Nanjunda Rao (2007). "Alternative building materials and Technologies", 2007, pp: 29-42.

[3]. Giuseppe Cultrone, Eduardo Sebastian, "Fly ash addition in clayey materials to improve the quality of solid bricks", 2009, Vol-23, pp: 1178-1184.

[4]. Halit Yazici. "Utilization of coal combustion bi-products in building blocks". 2007, Fuel, Vol 86, pp: 929-937.

[5]. P. Chindaprasirt, K. Pimraksa (2008). "A study of fly ash–lime granule unfired brick". Powder Technology, Vol-182, pp: 33–41.

[6]. WeiguoShen, Mingkai Zhou and Qinglin Zhao "Study on lime–fly ash–phosphogypsum binder" Construction and Building Materials., 21 pp. 1480–1485, 2007 •P.C.Varghese (2006). "Building Materials", pp: 19-44.

[7]. S. Kumar "Fly ash-lime- phosphogypsumcementitious binder: A new trend in bricks" Materials and Structures., Vol. 33, pp. 59-64, January-February 2000.

[8]. Sunil Kumar (2002). "A perspective study on fly ash–lime–gypsum bricks and hollow blocks for low cost housing development". Construction and Building Materials, Vol-16, pp: 519-525.

[9]. B. V. Venkatarama Reddy and K. Gourav "Strength of lime–fly ash compacts using different curing techniques and gypsum

additive" Materials and Structures., Vol. 44, pp. 1793–1808, 2011

[10]. A Paul Makesh, Vellingiri Anusuya "A Study on the Effect of Fly Ash on Hybrid Fibre Reinforced Concrete" 2016, IJSRSET 162323, Volume 2.

[11]. Vellingiri Anusuya, "An experimental study on the Durability of the fly ash mixed Concrete" in International Journal of Current Engineering and Scientific Research (IJCESR), Volume-4, Issue-11, ISSN (Online): 2394-0697, ISSN (Print): 2393-8374

[12]. Vellingiri Anusuya, Hamid Kemal, "A Experimental Study on the Fesibility of Fal-G Bricks" in International Journal of Recent Advancement in Engineering & Research Volume 04, Issue 01; January – 2018 [ISSN: 2456-401X]

[13]. Vellingiri Anusuya, Hamid Kemal, "A Experimental Study on the Fesibility of QFal-G Bricks" in International Journal of Recent Innovation in Engineering & Research, Pages 90 – 97, Volume: 03 Issue: 03 March – 2018, e- ISSN: 2456 – 2084