Paper on effect of aluminium dross on properties of concrete

[1]Khutale Ashwini L., [2]Khomane Vijay A., [3]Noori Faujiya Z., [4]Shinde Shubham S., [5]Taware Sneha P.

UG students
Department of Civil Engineering,
S. B. Patil College Of Engg., Indapur, India

***Abstract*— Aluminium dross is a remainder of aluminium production industry. This Industrial waste is harmful to Environment. To recycle and reuse this aluminium dross in construction industry is the main objective of this present paper. Test of compressive strength were conducted at replacement level of 5 and 10% by weight of cement for concrete. Replacement of aluminium dross reduce the raw material required for concreting and it is economical and environment friendly.**

***Index Terms*— Aluminum Dross, cement, compressive strength, permeability, porous, economical, environment friendly.**

I. INTRODUCTION

Aluminium Dross is the waste element obtained during aluminium production which consists of metals, salt oxides and other non-metallic substances. Aluminum dross contains various free metal and non-metal substance, rich in aluminium, aluminium oxide and silica. Aluminum dross having two types; namely black aluminium dross and white aluminium dross. waste disposition of aluminium dross is done by spreading it on the land in the form of salt cake, then it is sealed for preventing from leaching. If leaching of aluminum dross occurs then it harms the environment as it contains fluorides and other salts.

Handling and disposal of aluminium dross is complicated and dangerous to the environment. Thus, new technologies are need to develop for recycle these useful metals from the aluminium dross. Therefore, this research work is on the development of a technology to use this salt cake into valuable materials for concrete works.

II. LITERATURE REVIEW -

1. N. Y. Galat (2017) "Performance of concrete using aluminium dross". The objective of this project is to investigate the potential use of Dross in concrete products such as, non-aerated concrete, concrete cube. The advantage of this concrete over the conventional concrete is the reduction in the quantity of raw materials i.e; cement.

2. Gireesh M. (2016) Conducted study on "Investigation of concrete produced using recycled aluminium dross for hot weather concreting conditions". They investigated the utilization of recycled Aliminium Dross in producing concrete, which is suitable for hot weather concreting condition. The result observed that initial setting time of the recycled Aluminium Dross concrete extended by about 30min at 20% replacement level.

3. Shaik M. H. (2016) Has worked on "An Experimental Investigation on Use of Secondary Aluminium Dross in Cement Concrete". They studied mechanical properties of new concrete type obtained by adding Aluminium Dross, which is an impure Aluminium mixture, obtained from metals melting and mixing with flux. The result of this study indicate that Aluminium Dross can be used as an ingredient up to 5% to improve expanded concrete.

4. Abdurahim A. (2015) Conducted study on "Evaluating the Chemical Composition and the Molar Heat Capacities of a white Aluminum Dross". They studied evaluation of the chemical composition and the molar specific heat of white aliminium dross by using energy dispersive analysis (EDS) Technique and micro-reaction calorimeter(µRC) respectively. They determined weight percentage of chemical composition of the aluminium dross consists of Al (42.52%); C (6.09%); O (22.82%); Mg (15.54%); Fe (10.15%); Nb (0.51%) and K (2.37%).

5. M. Satish reddy (2014) Has worked on "An Experimental In Vestigation On Use Of Secondary Aluminium Dross In Concrete". The objective of this paper is to utilize the aluminium dross in the natural cycle by using it as an engineered material and to investigate the mechanical properties of new concrete type obtained by adding aluminium dross. The result is indicate that aluminium dross can be used up to 5% to improve quality of concrete.

6. Nesibe G. O. (2014) Conducted study on "The Effect of Aluminium Dross on Mechanical and Corrosion Properties of Concrete". They investigated the mechanical and chemical behaviour of new concrete type obtained by adding aluminium dross. They concluded that up to a certain limit, Aluminium Dross can improve expanded concrete and corrosion resistivity of concrete.

7. A. U. Elinwa (2011) Has worked on "The Use of Aluminum Waste for Concrete Production". They investigated that setting times, compressive and flexural strengths tests were conducted at replacement levels of 5, 10, 20, 30 and 40 % by weight of cement. They concluded that Aluminium Dross is used as a retarder and hence more suitable in hot weather concrete. The result of this study gives optimum replacement for compressive and flexural strengths are at 10% replacement.

III. MATERIALS -

- Cement
- Fine aggregate
- Coarse aggregate
- Water
- Aluminium Dross

1.Cement- Grade - 53, Type - Ordinary Portland Cement.
2.Fine Aggregate- Size of aggregate is passing through 4.75mm sieve is known as Fine Aggregate. Used fine aggregate in this investigation is crushed sand.
3.Coarse aggregate- Size of aggregate is more than 4.75mm is known as Coarse Aggregate. Less than 20mm size of aggregate are used.
4.Water- The water used for the study was free from chemical impurities and suspended solids which when present may have adverse effect on the strength of concrete.
5.Aluminium Dross- Aluminium produced by burning Aluminium scraps in a furnace at about 1900°C. The total waste produced per day is approximately 18 tones [5]. This aluminium dross is sieved then used as cement replacement for concrete production.

Table No. 1- Contents Of Aluminium Dross

Sr No.	**Content**	**Percentage(%)**
1	Al	15 to 80
2	Mg	0.2
3	Al_2O_3	52.0
4	Sl	32
5	H_2O	8 to 16

IV. METHODOLOGY-

Specimen Preparation-

For the mix proportion of M50, cubes of size 15cm x 15cm x 15cm are casted and compressive strength tests are taken on casted cubes of concrete in average of 3 cubes for single result of test. The tests are taken after 3days, 7days and 28 days to check compressive strength of AD mixed concrete. Mixing of material is done Mechanically. After that water was added gradually and mixed for 1 min. Then total concrete was used to fill the cubes. Also, vibrator was used to vibrate the concrete in cubes. The cubes were demolded after 24 hours and then placed for curing till the date of testing. Compressive strength test is taken on Compressive Strength Testing Machine.

V. RESULT AND DISCUSSION-

1. Compressive strength-

Table No. 2- Compressive strengths of cubes

Sr No.	**Cementitious material**	**Compressive Strength**		
		3 Days	**7 Days**	**28 Days**
1	100% OPC + 0% AD	55.3	70.2	69.33
2	95% OPC + 5% AD	17.2	22.8	30.1
3	90% OPC + 10% AD	8.4	14.3	21.4

2. Appearance of cubes-
   Swelling Property-

Fig No. 1- Concrete without AD and Concrete with AD

VI. CONCLUSION-

By adding aluminium dross in concrete it swells. Concrete becomes more porous and compressive strength decreases after mixing with aluminium dross. As the structure is porous, it shows higher permeability, so this type of concrete can be used as pavement blocks. It has lesser density than conventional concrete, so it can be used in high raised structures. Up to replacement of 5% of aluminium dross by weight of cement, it shows good properties.

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