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An Effective Study on Utilizing Bone Powder Ash as Partial Replacement of Construction Material

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Abstract: **With progression of technology and improved field of applications of concrete as well as mortars, the strength workability, flexibility as well as other features of ordinary concrete requires modifications to make it more appropriate. Our work studies the possibility of utilizing Cattle Bone Powder Ash as partial replacement of construction material in form of ash to substitute cement, in ground form to substitute sand in concrete and as particle to generate cement-particle. Partial replacement of Cement by Bone Powder Ash provides extra environmental as well as technical benefits. Cost of concrete reduces due to partial substitute of wastes and this knowledge assures high strength as well as high workability. By using bone powder ash in concrete makes it an efficient as well as innovative system of getting free of waste material that is damaging and dangerous to humans as well as environment.**

Keywords: **Concrete, Bone Powder Ash, Cement, Substitute, Flexibility, Workability.**

I. INTRODUCTION

Concrete is extensively used building material these days. Concrete is obtained by means of mixing of cement materials, water, aggregate as well as admixtures in necessary proportions. Its properties to a great extent depend on properties of its constituents. While cement is most important component of concrete and has comparatively low unit cost [1]. Choice of its suitable type and use has critical importance in obtaining stability of its preferred properties in cost-effective means for any concrete mix. Concrete is the most widely used man-made construction material in the world. The Ordinary Portland Cement is one of most important ingredients which is used for production of concrete and has no substitute in civil construction. However the production of cement involves release of huge amounts of carbon-dioxide gas into atmosphere, main provider for green house effect as well as global warming. Hence it is expected moreover to search for a different material or partially replace it by means of some other material. The search for such material, which is used as a choice for cement, must guide to global sustainable expansion as well as small environmental impact. Several studies were made for improvising the properties of concrete by means of adding of new materials; which might be natural materials or else recycle materials or else synthetic materials. The extra material can be replacing aggregate or else cement or else just as additive. Fly ash, Rice husk ash, and silica fume are some of pozzolanic materials which are used in concrete as partial substitute of cement. The strength, stability as well as other features of concrete will depend on properties of its ingredients, quantity of mix, technique of compaction as well as other controls during the process of placing as well as curing [2]. The purpose of our work is to study the possibility of utilizing Cattle Bone Powder Ash as partial replacement of construction material in form of ash to substitute cement, in ground form to substitute sand in concrete and as particle to generate cement-particle. Bone powder ash was obtained from burning in furnace at temperature above 900°C of cattle bones.

II. MATERIALS USED

Concrete is an artificial material where fine and coarse aggregates are bonded collectively by cement when mixed by water. The concrete has turn out to be so popular as well as essential due to its inherent nature. Concrete has unrestricted opportunities for pioneering applications, design as well as construction techniques. Its great flexibility as well as relative economy in filling extensive range of needs has made it is extremely competitive building material. Cement is a binder material which hardens separately, and binds other materials together. Cement is a substance that hardens and can combine other materials together.

Aggregates are significant elements in concrete and they give body to concrete, decrease reduction as well as effect economy. The simple

fact that aggregates occupy 70-80 % of concrete volume and their impact on different characteristics as well as properties of concrete is certainly considerable. Bone powder ash was attained from incineration in furnace at temperature above 900°C of cattle bones. The bones were cleaned as well as sun-dried to decrease its oil content previous to incineration. The burnt bone was permitted to cool previous to grounding in a hammer mill to fine powder [3]. Cattle bones are obtainable in commercial quantities in a variety of abattoirs that litter cities as well as villages in India. Chemical components of Bone Powder Ash as well as Cement are almost same thus Bone Powder Ash is one of normal pozzolanic material which replaces cement. Our work studies the possibility of utilizing Cattle Bone Powder Ash as partial replacement of construction material in form of ash to substitute cement, in ground form to substitute sand in concrete and as particle to generate cement-particle [5]. These objectives are achieved by means of determining: chemical composition of Bone Powder Ash by burning at various temperature as well as duration, tensile strength of series of concrete with various replacement levels of Cement by Bone Powder Ash (BPA).

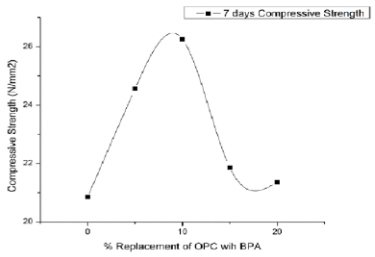

Fig1: compressive strength of Cubes for 7days

III. AN OVERVIEW OF SCOPE OF WORK

The implementation of our project was in three phases such as phase one, two and three. In the initial phase, study to find out cementitious value of Bone Powder Ash when burnt at various durations or at various temperatures was considered. In the second phase the study was made on concrete made of various replacement level of Bone powder Ash as a fine aggregate. In the third phase, the study was made on cement particle board which is made of Bone Powder Ash as a particle as well as cement as a binder. In the initial Phase, Bone Powder Ash was burnt to form charcoal first in open air afterward, charcoal was crushed to a finer particle. The chemical composition was carried out to determine mainly calcium, silicon as well as Iron [4]. In the second phase fundamental experiments are made on aggregate as well as cement to discover specific gravity, excellence modulus for mix design and moreover experiments are done on Bone Powder Ash to make out specific gravity, excellence modulus of Bone Powder Ash. In the third phase, M20 Mix ratio is considered which inciludes 0%, 5%, 10%, 15%, 20% replacement level of Cement by Bone Powder Ash. The concrete were considered for Grade 30 and water cement ratio was set aside at 0.57. The substitute of Bone Powder Ash was by weight. The compressive as well as tensile strength were performed for 7 as well as 28 days of age [6].

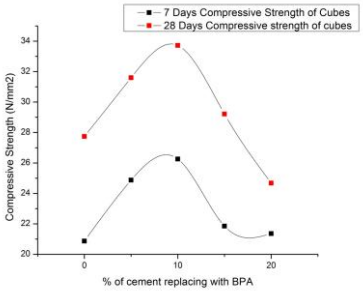

Fig 2: Comparison for Compressive Strength for 7 and 28 days

IV. CONCLUSION

We study the possibility of utilizing Cattle Bone Powder Ash as partial replacement of construction material in form of ash to substitute cement, in ground form to substitute sand in concrete and as particle to generate cement-particle. The implementation of our project was in three phases such as phase one, two and three. In our work we have studied the properties of Bone Powder Ash. From our work the performance of blended concrete is found to be good quality. Partial replacement of Cement by Bone Powder Ash provides extra environmental as well as technical benefits. Chemical components of Bone Powder Ash as well as Cement are almost same thus Bone Powder Ash is one of normal pozzolanic material which replaces cement. Cost of concrete reduces due to partial substitute of wastes and this knowledge assures high strength as well as high workability. Compressive Strength of the cube for seven days is slowly increasing to ten percentage replacement of Bone powder ash to cement and subsequently decreases but at 15% strength is more when measured to specimen devoid of replacement of Bone powder ash. Bone mineral is a difficult chemical made from calcium, phosphate as well as hydroxyl ions, but which might moreover contain little quantity of cationic, magnesium as well as strontium replacing calcium as well as bicarbonate, replacing hydroxyl anions. Bone is a tough, fibrous material in mammalian body which provides shape as well as support to body. Our technique of preparation of bone ash precludes option that this excess may be derived from collagenate of bone matrix. The bone ash

composition is comparable to that of tri-calcium phosphate. The bone ash in such condition is reduced to fine powder. The organic matter leaves a compact white mass of bone salts. By using bone powder ash in concrete makes it an efficient as well as innovative system of getting free of waste material that is damaging and dangerous to humans as well as environment. It makes in amount of non-renewable resources that goes in cement production. It helps in reduction of green house of emission, as a result improved environment health.

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AUTHOR's PROFILE

SBVS MANIKANTA VARMA was born in 1991 at west Godavari district, andhra Pradesh. He received his bachelor of technology degree in civil engineering from Siddhartha institute of engineering technology ,Jawaharlal Nehru technological university anantapur in 2012. At present he is final year student of master's degree in structural engineering from gurunanak institute of technology, jntu Hyderabad.

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Dr. S. SREENATHA REDDY Professor & Principal, Guru Nanak Institute of Technology under JNTUH, Hyderabad. Dr. S.SREENATHA REDDY obtained B.Tech, Mechanical Engineering from JNTU, Hyderabad, M.Tech.-Heat power, Refrigeration & Air conditioning from JNTU, Hyderabad and Ph.D. Faculty of Mechanical Engineering from JNTUA . Dr. S.SREENATHA REDDY held various administrative posts and developed the Institution with his projects and developmental activities. Notable among his award i.e National award for best research publication i.e Jawaharlal Nehru memorial prize issued Institution of Engineers on the occasion of Inauguration 27 th Indian Engineering Congress at New Delhi. He is a young & dynamic Technical Person worked 14 years in Teaching in Mechanical & Aeronautical field and 3 years in Industry from Thermal Power plants. Dr. S. Sreenatha Reddy is having rich experience in administrative area. Earlier he worked as Principal, Head of both the Aeronautical & Mechanical department, coordinating R&D cell for Aeronautical Research and Development Board (ARDB) projects, TPO & developing courseware and implementing ISO 2001 and NBA Accreditation.

