EXPERIMENTAL INVESTIGATION ON WATER HYACINTH ASH AS A SUPPLEMENTARY CEMENTING MATERIAL

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INTRODUCTION:

General

Concrete is a construction material composed of cement, fine aggregates (sand) and coarse aggregates mixed with water which hardens with time. Portland cement is the commonly used type of cement for production of concrete. Concrete technology deals with study of properties of concrete and its practical applications. In a building construction, concrete is used for the construction of foundations, columns, beams, slabs and other load bearing elements. There are different types of binding material is used other than cement such as lime for lime concrete and bitumen for asphalt concrete which is used for road construction. Various types of cements are used for concrete works which have different properties and applications. Some of the type of cement are Portland Pozzolana Cement (PPC), rapid hardening cement, Sulphate resistant cement etc. 1.1 Concrete: 1.1.1 Components of Concrete 1.1.2 Grades of Concrete 1.1.3 Preparation of Concrete 1.1.4 Types of Concrete Construction 1.1.5 Steps of Concrete Construction 2 1.1.1 Components of Concrete: Materials are mixed in specific proportions to obtain the required strength. Strength of mix is specified as M5, M10, M15, M20, M25, M30 etc, where M signifies Mix and 5, 10, 15 etc. as their strength in kN/m2. In United States, concrete strength is specified in PSI which is Pounds per Square Inch. water cement ratio plays an important role which influences various properties such as workability, strength and durability. adequate water cement ratio is required for production of workable concrete. When water is mixed with materials, cement reacts with water and hydration reaction starts. this reaction helps ingredients to form a hard matrix that binds the materials together into a durable stone-like material. concrete can be casted in any shape. since it is a plastic material in fresh state, various shapes and sizes of forms or formworks are used to provide different

shapes such as rectangular, circular etc. Various structural members such as beams, slabs, footings, columns, lintels etc. are constructed with concrete. aci 318 building code requirements for structural concrete and aci 301 specifications for structural concrete are used in united states as standard code of practice for concrete construction. There are different types of admixtures which are used to provide certain properties. Admixtures or additives such as pozzolans or superplasticizers are included in the mixture to improve the physical properties of the wet mix or the finished material. various types of concrete are manufactured these days for construction of buildings and structures. these have special properties and features which improve quality of construction as per requirement. Components of concrete components of concrete are cement, sand, aggregates and water. mixture of portland cement and water is called as paste. so, concrete can be called as a mixture of paste, sand and aggregates. sometimes rocks are used instead of aggregates. the cement paste coats the surface of the fine and coarse aggregates when mixed thoroughly and binds them. soon after mixing the components, hydration reaction starts which provides strength and a rock solid concrete is obtained. 4 Types of Concrete Construction: Concrete is generally used in two types of construction, i.e. plain concrete construction and reinforced concrete construction. In PCC, it is poured and casted without use of any reinforcement. This is used when the structural member is subjected only to the compressive forces and not bending. When a structural member is subjected to bending, reinforcements are required to withstand tension forces structural member as it is very weak in tension compared to compression. Generally, strength of concrete in tension is only 10% of its strength in compression. It is used as a construction material for almost all types of structures such as residential concrete buildings, industrial structures, dams, roads, tunnels, multi storey buildings, skyscrapers, bridges, sidewalks and superhighways etc. Example of famous and large structures made with concrete are Hoover Dam, Panama Canal and Roman Pantheon. It is the largest human made building materials used for construction.

Fig 1 -Water Hyacinth

Flowers:

The flowers of the water hyacinth are purple with blue and yellow markings. The flowers grow in small clusters around the leaves and are similar to lilies in appearance. Each flower measures four to seven cm in diameter, and each stalk bears, on average, between six and 10 flowers. The flowers are considered highly attractive, and the water hyacinth is often a feature of ornamental ponds and botanical gardens.

Fig 2 – Water Hyacinth Flower

OBJECTIVES:

1. To incorporate the utilization of and Water hyacinth ash an additional material in concrete mixes.
2. To partially replace cement mixture with water hyacinth ash which is produced by oven drying of the material gives a super strength and high durable concrete.
3. To explore various uses of Water Hyacinth to replace the concrete and to prepare mixes containing various proportions.

EXPERIMENTAL PROGRAMME :

Nomenclature of the Mix:

The nomenclature used in the experimental program for concrete mix is shown in table below:

M30 Grade	No of cubes
Convention concrete	3
Replacement of 6% WHA	3
Replacement of 8% WHA	3
Replacement of 10% WHA	3

Table No:1: Nomenclature Of The Mix

Fig- 3 : M-SAND

M-Sand: M-Sand stands for Manufactured Sand. M-sand is crushed aggregates produced from hard granite stone which is cubically shaped with grounded edges, washed and graded with consistency to be used as a substitute of river sand. Natural or River sand are weathered and worn out particles of rocks and are of various grades or sizes depending upon the amount of wearing. Now-a-days good sand is not readily available; it is transported from a long distance. Those resources are also exhausting very rapidly. So it is a need of the time to find some substitute to natural river sand. The artificial sand produced by

proper machines can be a better substitute to river sand. The sand must be of proper gradation (it should have particles from 150 microns to 4.75 mm in proper proportion). When fine particles are in proper proportion, the sand will have fewer voids. The cement quantity required will be less. Such sand will be more economical. Demand for manufactured fine aggregates for making concrete is increasing day by day as river sand cannot meet the rising demand of construction sector. Natural river sand takes millions of years to form and is not repleneshible. Because of its limited supply, the cost of Natural River sand has sky rocketed and its consistent supply cannot be guaranteed. Under this circumstances use of manufactured sand becomes inevitable.

RESULTS:

Tests Report of Materials:

S.No	Physical Test	Obtained Result
1	Fineness	4%
2	Consisteney	29%
3	Initial Setting Time	36 min
4	Final Setting Time	265 min
5	Soundness	5 mm
6	Specific Gravity	2.80

Table -2: Physical Tests Result of Cement

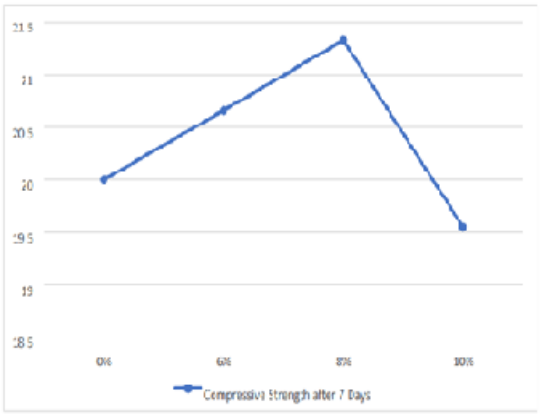
Physical Tests Result of Aggregate

S.No	Physical Test	Obtained Result
1	Los Angeles Abrasion Test	10.36%
2	Specific Gravity 1) Coarse Aggregate 2) Fine Aggregate(M-sand)	2.7 2.8
3	Water Absorption 1)Coarse Aggregate 2)Fine Aggregate(M-Sand)	0.8% 0.6%

Table -3: Physical Tests Result of Aggregate

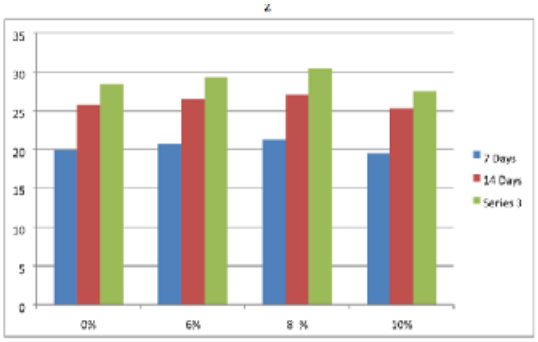
Table -4: Compressive Strength Results

%Addition of WHA to cement	Compressive strength of concrete (Mpa) age in days		
	7	14	28
0	20	25.77	28.44
6	20.66	26.44	29.33
8	21.33	27.11	30.44
10	19.55	25.33	27.55



Graph 1 Compressive Strength after 7 Days

Comparison:



Graph 2- Comparison of Compressive Strength during different stages in Bar

CONCLUSION:

- This study was carried to obtain the results, test conducted on the water hyacinth ash modified cement concrete mix in order to ascertain the influence of water hyacinth ash on the characteristics strength of concrete
- In this study the effect of the replacement of cement with water hyacinth ash on the strength investigated
- Based on the results obtained, the following conclusions are drawn:
- The compressive strength of concrete reduced as the % replacement of cement by water hyacinth ash is increased. Optimum dosage of water hyacinth is 9%. Standard consistency of cement increased with the increase in % addition of water hyacinth ash.
- Setting time of cement is increased with increase in % of water hyacinth ash. Workability of concrete increase with increase in %. Addition of water hyacinth ash.

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