

# A Review of Compressive Strength of Partially Replaced Paper Pulp Concrete

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**Abstract:** Of the various waste products produced various factories of India, paper industry waste, paper It is noteworthy that pulp has health problems, Hazards and disposal. Paper pulp is a growing problem Landfills are used every year in India Cultivation of arable land causes a decline. In some cases, Crop lands are used for dumping pulp, which reduces A threat to fertility and human health. Disposal of pulp severe water pollution into rivers and canals. Some paper mill companies try to get rid of it by using it Fires cause air pollution to burn it. It Waste paper reported that the pozzolanic was present in the pulp partially used cementation features Replace cement clinker in concrete production. This paper deals with experimental research Estimate the optimum percentage of waste paper pulp Used for the manufacture of concrete. M25 grade concrete was used in this study. Three different re-establishment level of cement with waste Paper pulp means 5, 10, and 15% used and PPC 0% cement re-leveling concrete is also made to compare. Compressive testing strength of concrete tested at curing ages of 7 and 28 days. Total The partial use of paper pulp reveals the result Improving low strength in place of cement Up to 20% replacement level of grade concrete. The use of Waste paper pulp as a partial replacement of cement, significantly reducing construction costs otherwise environmental hazards are made.

**Keywords:** Compressive strength, Paper pulp concrete.

## 1. Introduction

Over 300 million tons of industrial wastes are being produced per annum by chemical and agricultural process in India. These materials possess problems of disposal, health hazards and aesthetic problem. Paper fibers can be recycled only a limited number of times before they become too short or weak to make high quality paper. It means that the broken, low- quality paper fibers are separated out to become waste sludge. Paper sludge behaves like cement because of silica and magnesium properties which improve the setting of the concrete. The quantity of sludge varies from mill to mill. The amount of sludge generated by a recycled paper mill is greatly dependent on the type of furnish being used and end product being manufactured. Paper mill sludge can be used as an alternative material applied as partial replacement of fine aggregates in manufacturing fresh concrete intended to be used for low cost housing projects. About 300 kg of sludge is produced for each tone of recycled paper. This is a relatively large volume of sludge produced each day that makes making landfill

uneconomical as paper mill sludge is bulky. By adjusting the mixture to an equivalent density, concrete mixtures containing the residuals can be produced that are equal in slump and strength to a reference concrete without residuals. In 1995, the U.S. pulp and paper industry generated about 5.3 million metric tons of mill wastewater-treatment residuals (on oven-dry basis), which is equivalent to about 15 million metric tons of dewatered (moist) residuals. About half of this was disposed in landfills/lagoons, a quarter was burned, one-eighth was applied on farmland/forest, one sixteenth was reused/recycled in mills, and the rest, one sixteenth, was used in other ways. Pulp and paper mill residual solids (also called sludge) are composed mainly of cellulose fibers, moisture, and papermaking fillers (mostly kaolinitic clay and/or calcium carbonate).



The Environmental Protection Agency said (EPA) (US EPA 2000), United States of America Recycled 45 percent of the discarded paper annually. This means About 55 percent or 48 million tonnes of paper is tossed or Going into the landfill. Traditionally speaking, it takes Fifteen trees to make a ton of paper. This means that 720 million trees are used each year and buried in the landfill. (Point 6 from Reference) Cement concrete remains the main construction material Used in construction industries. Its compatibility and for that Compatibility with the changing climate, The Concrete must be able to conserve and protect resources Leads to the environment, economically and appropriately Energy. Research on the use of waste materials

this is important as material waste is steadily increasing in population growth and urban development.

## 2. Literature review

- A project conducted on “Experimental Investigation of using papercrete and recycled aggregate as a coarse aggregate” in 2015 - by T. Subramani, G. Shanmugam states that the aim of the project was to determine the strength and durability characteristics of high strength structural concrete by using recycled coarse aggregates with papercrete, which will give better understanding on properties of concrete with recycled aggregates and to determine the compressive strength of papercrete.
- In a study of “Structural properties of a new material made of waste paper” by Fuller B., Fafitis A. and Santamaria J, they have conducted some mechanical and physical parameters of papercrete to provide low cost, sustainable housing.
- Seyyedeh Fatemeh Seyyedalipour, Daryosh Yousefi Kebria, Nima Ranjbar Malidarreh and Ghasem Norouznejad state in their research work published in 2014 that the purpose of “Study of Utilization of pulp and paper Industry wastes in Production of Concrete” was to investigate the using of pulp and paper industry wastes in various concrete mixes containing various contents of the waste to reduce environmental effects of these wastes disposal.
- A Study of Papercrete towards building sustainable and resilient Infrastructure” by Syed Kaiser Bukhari, Maqbool Yousuf and Ayaz Mahmood Dar states that the investigations show that the papercrete can be used as a very good supplement of wood as it has strengths comparable to wood. The total weight, cost and CO<sub>2</sub> emissions during its production as compared to the normal concrete are considerably reduced. The study also concluded that the dried papercrete has rough surface which increases its surface area and provides a very strong bond from one block to the next. There are significant challenges in constructing with papercrete but also opportunities.
- An “Experimental investigation of Papercrete Concrete” by T. Subramani and V. Angappan in 2015 aims to investigate the potential use of paper waste for producing a low cost and light weight composite brick as a building material depending upon the compressive strength and water absorption.

## 3. Materials required

- *Cement*: This is one of the binding materials in this project. Cement, an important building material in today's construction 53 Grade Ordinary Portland Cement (OPC) Conforming IS: 8112-1989.
- *Fine Aggregate*: Concrete produced from fine gravel alloy (Sand), a binder (cement) and water. Fine-gravel Concrete is similar to building mortars in its composition and some

features. It is mainly used for the manufacture of thin and conventional reinforced-concrete structural Parts and products. Fine-aggregate concrete Because it is used in highway and airfield construction Higher tensile strength results from it Fine-grained structure. Lack of coarse aggregates (Crushed stone or gravel) considerably easier Concrete manufacturing, transportation and keeping, especially when using concrete pumps. A The disadvantage of fine-aggregate concrete is increased Binder utilization compared to other types Concrete and associated greater shrinkage and creep. The size of the binder in the concrete can be reduced Pulverizing some sand through the use of plasticizers, Or by autoclaving products. Sand located Available locally and passes through a 4.75mm IS sieve Used.

- *Coarse aggregate*: Locally available crushed blue granite stones The nominal size corresponds to a graded gravel of 12.5 According to IS 38: 383 - 1970. crushed granite aggregates 4.75 mm passes through the sieve and is used Transmits all samples. Many investigations are over The maximum size of the coarse aggregate should be Limited to mixed strength. In addition, Cement Paste - Total Ratio, Total Type a Greater impact on concrete dimensional stability.

## 4. Methodology

As per this study the Paper pulp Based Concrete (partially replaced) is tested:

- Tests on fresh concrete: The consistency and workability of all the concrete mixtures was determined through slump tests and compaction factor test. The slump tests were performed according to IS 1199- 1959.
- Tests on hardened concrete: The tests have been performed to determine the mechanical properties were compressive strength, splitting tensile-strength and flexural strength. The test results are reported as the average of the three tested samples in the corresponding test. From each concrete alloy, 150 mm 3 cubes, 100 x 100 x 500 mm beams and 150 x 300 mm cylinders were laid for the determination of compressive strength, flexural strength test [18] and dividing tensile strength [19]. Cube compressive strengths were determined at 14 and 28 days according to IS 516-1959. Flexural strength test was performed using a simple beam with a two-point loading method at 28 days of curing age, in accordance with IS 516-1959. The separation tensile-strength test was performed in accordance with IS 5816-1999.

## 5. Results and discussion

As per the review of previous studies the strength of concrete is enhanced for a particular proportion. And as for above review of all those papers we found and results are as follows,

Table 1

Average compressive strength of concrete as per Jagdish D. Kalapad

Percentage of paper pulp	7 days curing strength (N/mm <sup>2</sup> )	28 days curing strength (N/mm <sup>2</sup> )
0%	20.22	32.22
5%	20.88	32.42
10%	22.66	37.02
15%	19.47	27.32

## 6. Conclusion

As per the above study the Compressive strength of concrete shows maximum (37.02) when paper pulp is added 10% to the concrete. We suggest to add only 10% for better compressive strength.

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