

Partially Replacement of Cement with Hypo-Sludge and Reckon Fiber is used As an Admixture in Concrete

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ABSTRACT: Concrete plays an important role as a construction material in the world. At present, waste materials from various industries are added to the mix in every year, Over 400 million tons of waste materials are being produced by various industries. Hypo-sludge is the waste material from paper industry which has some chemical properties i.e. cementaneous properties similar as cement. Hence it can be used as an economical building material thus reducing the air pollution caused by the disposal of these waste. Reckon 3's is a polypropylene mono-filament, discrete, discontinuous short fiber that can be used in concrete to control and improve its properties. In this work, various mechanical properties of concrete containing Hypo-sludge and Reckon 3's fibers are studied. Hypo-sludge are used in various percentage (i.e. 10%, 20%, 30%, 40%, 50%,60% & 70%) as a replacement of cement and Reckon 3's fibers are used at 0.1%,0.2%, 0.3%, 0.4%, 0.5%, 0.6% & 0.7% as an admixture in concrete. The main purpose of this project is to reduce the amount of the cement and increase the strength of the concrete. Reckon 3's has better properties to resist internal stress due to shrinkage, reduces segregation and bleeding, and also results in a more homogeneous mix. This leads to reduced permeability and better strength which improves durability.

Keywords: Hypo-sludge; reckon fiber; strength; durability; shrinkage; segregation; bleeding

INTRODUCTION

Cement is a flexible design material utilized as a part of the majority of the structural building structures. Its prevalence as a fundamental building material in development is a direct result of its economy, great sturdiness, ease with which it can be fabricated the capacity to form it into any shape and size and its high compressive quality. Numerous scientists have made endeavor to utilize the waste material to decrease the transfer issues and to enhance the mechanical properties of cement. Fly cinder, silica fume, blast heater slag and so forth are a portion of the waste materials utilized for making concrete. Common solid, when subjected to the thorough test of time and compelling climate conditions, tends to split and lose its quality. It can prompt drainage and consumption of essential steel and ruining of cement. Utilization of consistently scattered Reckon 3s filaments lessens isolation and draining furthermore brings about a more homogeneous blend. This prompts better quality and decreased porousness which enhances sturdiness. The present research, an endeavor has been made to use the Hypo sludge and Reckon 3s filaments for making concrete.

amount of silica and magnesium properties that it behaves like cement. use of hypo sludge in concrete can save the paper industry disposal cost and also produced a sustainable concrete for construction.



Figure 1: Hypo-sludge

Cement:

Cement is a binding material. Ordinary Portland cement is used in this project.



Fig 2-cement

MATERIAL NAD METHODS

Hypo-Sludge:-

Hypo sludge produced in a large amount as by product of paper industry and is usually used in concrete production as partial replacement of cement. It contains low calcium and minimum

Sand

Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. It is defined by size, being finer than gravel and coarser than silt. For example, it is the primary form of sand apparent in areas where reefs have dominated the ecosystem for millions of years like the Caribbean.



Fig 3-sand

Reckon 3's Fiber

Reckon 3s fiber was utilized as an optional fortification material. It captures shrinkage splits and expands imperviousness to water infiltration, scraped spot and effect. It makes concrete homogenous furthermore enhances the compressive quality, pliability and flexural quality together.



Fig 4-fine aggregate

Coarse Aggregate

The divisions from 20 mm to 4.75 mm are utilized as coarse total. The Coarse Aggregates from smashed Basalt rock. The Flakiness and Elongation Index were kept up well underneath 15%



Fig 4: Coarse aggregate

Fine Aggregate

Those divisions from 4.75 mm to 150 micron are termed as fine total. The stream sand and pulverized sand is being utilized as a part of mix as fine total. The waterway sand is wash and screen, to take out harmful materials and over size particles.

Water

Water is an important ingredient of concrete as it actually participates in the chemical reaction with cement. Since it helps to form the strength giving cement gel, the quantity and quality of water is required to be looked into very carefully.



Fig 5: Reckon 3's fiber

EXPERIMENTAL WORK

To understand the behavior of concrete in compression, split and flexure, cubes, cylinders and prisms are cast. The average values of three specimens are taken. Conventional concrete(c): The conventional concrete specimens are made up of M20 concrete with the mix ratio hypo sludge Concrete(HSC): Concrete specimens are made up of

cement, Hypo Sludge, fine aggregate, water and Reckon. Increase strength of concrete added Reckon 3s for 1 cum of concrete Hypo sludge was 5%, 10%, 15% and 20% with Reckon 3s 5%, 10%, 15% and 20% replacement of cement.

Preparation of Specimens

Preparation of conventional concrete: Preparation of test specimen includes the following procedure: -

Batching: The quantity of ingredients (Cement, Fine aggregate, Coarse aggregate and water) were arrived by conducting proper weigh batching and stored separately for mixing.

Preparation of mould: The mould for prism, cube and cylinders were collected and they are properly checked for their dimensions. Crude Oil can be applied to inner side of the molds for the smooth replace.

Mixing: The Cement and Sand in the specified proportions are mixed thoroughly. Then this mixture is spread evenly on a coarse aggregate. The mixture is turned over twice in a dry state. Then the measured quantity of water is added and the mixture thoroughly to get a uniform mix.

Compacting: Compacting is done by using steel rod. All fresh concrete contains tiny bubbles of air. The process of removal of entrapped air and uniform placement of concrete to form homogeneous dense mass is termed as Compaction.

Curing: Water curing is used for conventional concrete. Curing concrete can be defined as a chemical process that ensures the hydration of cement in newly placed concrete. The curing process is part of the chemical reaction between Portland cement and water to hydrate the product, creating a gel that can be laid down only in water-filled space. It usually involves the control of moisture loss and the temperature affecting the hydration process.

Demoulding: The casted specimens are demoulded in such a way that there are no possibilities of damaging of specimens.

Preparation of Hypo sludge with Reckon fiber Concrete:

Preparation of Hypo Sludge Concrete with Reckon 3s Preparation of test specimen includes the following procedure: **Batching:** The quantity of ingredients (Cement, Fine aggregate, coarse aggregate Hypo Sludge and water) were arrived by conducting proper weigh batching and stored separately for mixing.

Preparation of mould: The mould for cube collected and they are properly checked for their dimensions. Crude Oil can be applied to inner side of the moulds for the smooth replace. is spread evenly on

a coarse aggregate. The mixture is turned over twice in a dry state.



Fig 6-Material used

Mixing:

The Cement and Sand in the specified proportions are mixed thoroughly. Then this mixture Then the measured quantity of water is added and the mixture thoroughly to get an uniform mix. **Compacting:** Specimen each one set 3 beams, 3 cubes and 3 cylinders were casted. Specimen was prepared by various proportion of Hypo Sludge in 5%, 10%, 15%, and 20%.

Demoulding: The casted specimens are demoulded in such a way that there is no possibility of damaging of specimens.



Fig -7 concrete cube

Curing: 28 days curing achieve strength Water curing is used for recycled course concrete. Curing concrete can be defined as a chemical process that ensures the hydration of cement in newly placed concrete. The curing process is part of the chemical reaction between Portland cement and water to hydrate the product, creating a gel that can be laid down only in water-filled space. It usually involves the control of moisture loss and the temperature affecting the hydration process.

Tests on Hardened Concrete: Compressive Strength Test: Compressive strength is the capacity of a material or structure to withstand axially directed pushing forces. When the limit of compressive strength is reached, brittle materials are crushed. Testing Machine: The testing machine may be of any reliable type, of sufficient capacity for the tests and capable of applying the load at the required rate. The permissible error shall be not greater than ± 2 percent of the maximum load. The testing machine shall be equipped with two steel bearing platens with hardened faces. One of the platens (preferably the one that normally will bear on the upper surface portion of a sphere, the centre of which coincides with the central point of the face of the platen. The other compression platen shall be plain rigid bearing block. The bearing faces of both platens shall be at least as large as, and preferably larger than the nominal size of the specimen to which the load is applied. The compression mechanism is shown in Figure Compressive Strength = P/A Where, P - Ultimate Load A - Cross sectional area of the specimen.



Fig-8 universal testing machine

RESULTS AND DISCUSSION

Compressive Strength Test: 150 mm X 150mm X 150 mm concrete cubes were casting using M20 grade concrete. Specimens with ordinary Portland cement (OPC) and OPC replaced with hypo sludge at 5%, 10%, 15% and 20% levels and add Reckon admixture constants were cast. During casting the cubes were mechanically vibrated by using a table vibrator. After 24 hours, the specimens were removed from the mould and subjected to water curing For 7 th, 14th and 28th days. After curing, the specimens were tested for compressive strength using a calibrated compression testing machine of 2000 kN capacity.

M20 Compressive Strength at 7th Day: M20 grade of concrete Compressive Strength at 7th Days curing: Increase strength of concrete added Hypo Sludge 5%,

10%, 15% and 20% replacement of cement and added Reckon 3s 5%, 10%, 15% and 20%.

Table 1: M20 comparison strength on 7th day

Mix Design	% of Cement	% of Hypo sludge	%of Recron 3s	% of Fine aggregate	% of course aggregate	Compressive Strength N/mm ²
M20	100	0	0	100	100	22.06
	90	5	5	100	100	24.26
	80	10	10	100	100	26.45
	70	15	15	100	100	28.71
	60	20	20	100	100	23.98

M20 Compressive strength at 14th day curing: M20 grade of concrete Compressive Strength at 14th Days curing. Increase strength of concrete added Hypo Sludge 5%, 10%, 15% and 20% replacement of cement and added mixtures Reckon 3s 5%, 10%, 15%, 20%.

Table 2: M20 comparison strength on 14th day Reckon 3s

Mix Design	% of Cement	% of Hypo sludge	%of Recron 3s	% of Fine aggregate	% of course aggregate	Compressive Strength N/mm ²
M20	100	0	0	100	100	23.56
	90	5	5	100	100	24.89
	80	10	10	100	100	27.04
	70	15	15	100	100	29.24
	60	20	20	100	100	24.04

M20 Compressive Strength at 28th Day: M20 grade of concrete Compressive Strength at 28th Days curing. Increase strength of concrete Hypo Sludge 5%, 10%, 15% and 20% replacement of cement and 50 ml added admixtures Reckon 3s.

Table 3: M20 comparison strength on 28th day Reckon 3s

Mix Design	% of Cement	% of Hypo sludge	%of Recron 3s	% of Fine aggregate	% of course aggregate	Compressive Strength N/mm ²
M20	100	0	0	100	100	23.56
	90	5	5	100	100	24.89
	80	10	10	100	100	27.04
	70	15	15	100	100	29.24
	60	20	20	100	100	24.04

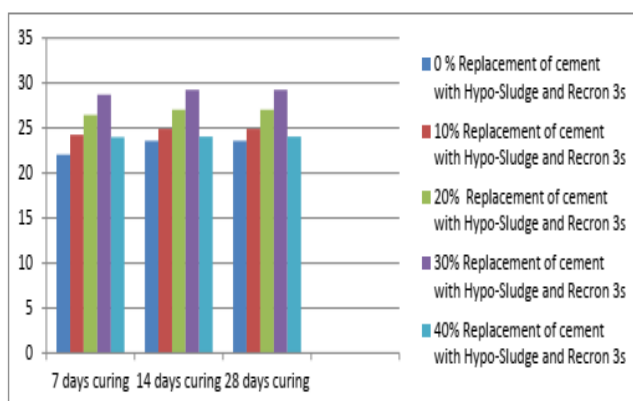


Figure 9: Comparison bar chart

CONCLUSIONS

In the present work, the Reckon 3s fiber are used for effectively controlled cracking and use the concrete with crack free and also increase properties like compressive of the concrete & hypo sludge use for increasing the strength of concrete. In this project we conclude that there is noteworthy increase in strength of Reckon reinforced concrete and hypo sludge as compare to plain cement concrete. The overall strength of Reckon and hypo sludge concrete increase by 7% compare to plain concrete. Thus Reckon and hypo sludge can be use as an economical secondary reinforcement for concrete.

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