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USES OF DISCARDED TYRE RUBBER CRUMB POWDER

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Abstract –The main aim of this research is to analyse the feasibility of recycled scrap tyre for use in the field of construction.Our aims to find the concrete mixture using recycled tyre rubber that can enhance the waterproofing capacity of the construction concrete. The scrap tyres are being generated and accumulated in large volumes causing an increasing threat to the environment. In order to eliminate thenegative effect of these depositions and in terms of sustainable developmentthere is great interest in the recycling of these non-hazardous solid wastes. The potential of using rubber from worn tyres in many civil engineeringworks has been studied for more than 30 years. Applications where tyres canbe used and where the addition of tyre rubber has proven to be effective inprotecting the environment and conserving natural resources include theproduction of cement mixtures,waterproofing, road construction and geotechnical works, recycling of tyres in the applications mentioned above represents a suitablemeans of disposal for both environmental and economic reasons
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Key Words:Waste tyre rubber crumbs, water absorption of,compressive strength,workability of concrete rubber

1.INTRODUCTION

Processing end-of-life tyres and rubbers id a critical aspect of modern waste management. End-of-life tyres and elastomers products have been recognizeby European Union as a critical and valuable resource for the circular economy. Here In India and other country like China the rapid development of the automobile industry and packaging plastic industry, the quantity of the waste tires and waste plastics is increasing. For instance, 233 million tons of waste tires was produced in China in 2009, and now waste tires production has more than three hundred million tons. In addition, more than 5 million tons of waste plastics is produced every year in China. General handling method for these solid wastes, such as incineration and landfill, is very serious to the environment pollution. Therefore, it is important to recycle the waste rubber and plastic materials to reduce the environmental pollution, including eliminating black pollution caused by waste tires and white pollution caused by waste plastics.

About one crore 10 lacs of new vehicles are added each year to the Indian roads. Due to this is about 3 crores of tyres are been discardedby the vehicles users every year and causing a potential threat of the environment. Even if tyres are recycled yet a huge number of discarded tyres are been added to landfills or tyre dumps or construction as roof for waterproofing materials. This dumped waste rubber tyres can be used in Civil Engineering construction work or waterproofing work as well.

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CrumbRubber

Crumb rubber is the name is given by any material derived by reducing scrap tyre or other rubber into uniform granules with the inherent reinforcing materials such as steel & fibre removed along with any other type of inert contaminants such as dust glass or rock. **Crumb rubber** is manufacture by the primary feedstock, and it is produced by an ambient process (mechanical sizing) or by cryogenic process (freezing)in the mechanical process tyres are reduce to chips or shreds and then put throughgranulators which separates and remove loose steel and fibre and further reduce rubber particles size Finally, the small rubber are chunks are ground to produce rubber crumb of 35 to 85 mesh size. In the cryogenic process, the tyre chips are frozen in liquid nitrogen as they pass through a cryogenic tunnel the broken down by impact. They then pass series of screen meshwhere they are shuttered into there are three component parts; rubber, steel, & fabric. Although the cryogenic process is the more expensive of the two, it produces smoother and smaller crumb.

The main use of crumb rubber from recycled tyre are rubberized asphalt cushioning for Astroturf, ground cover under playground equipment and athletic fields/tracks and also in construction works.

The image is showing The crumb rubber from recycled tyre which is as following...

Crumbrubberpowderfromrecycledtyre

2. Methodology

A) Collection of raw material

1. Tyer Rubber Crumb
2. River Sand
3. Cement Ordinary Portland Cement 53grade Conforming to Is:8112-1989
4. Simple Water

B) TESTING

CEMENT

1. Initial And Final Setting Time
2. Compressive Strength Test
3. Consistency Test

SAND

1. Specific Gravity
2. Bulking Of Sand
3. Silt Component Test

AGGREGATES

1. Abrasion Test
2. Impact Load Test
3. Flakiness Index Test
4. Water Absorption Test
5. Specific Gravity Test

C) MIX DESIGN

The process of selecting suitable ingredients of concrete and determining their relative amounts with the objective of producing a concrete of the required, strength, durability, and workability as economically as possible, is termed the concrete mix design.
Generally, we are using M20 grade of concrete.

- **Quantity of material used for Conventional Concrete Cubes**
  Weight of cement = 5160gm
  Weight of sand = 7725gm
  Weight of aggregate = 15480gm

- **Quantity of material used for rubberish Concrete Cubes with 3.2% crumb replacement of fine aggregate**
  Weight of cement = 5160gm
  Weight of sand = 7493.25gm
  Weight of crumb = 231.75gm
  Weight of aggregate = 15480gm

- **Quantity of material used for rubberish Concrete Cubes with 1.2% crumb replacement of fine aggregate**
  Weight of cement = 5160gm
  Weight of sand = 7647.75gm
  Weight of crumb = 77.25gm
  Weight of aggregate = 15480gm

3. RESULTS

A) CEMENT

1. Initial Setting Time and Final Setting Time = 78 Min & 185 Min (Initial setting Time Should Be More Then 30min & Final Setting Time Should Be 600min)
2. Strength test =23 M pascal for 7 days range (20to35%)
3. Consistency test = 30% range (25to30)

B) SAND

1. Specific Gravity = 2.6% (Ranges 2.65to2.67)
2. Bulking Of Sand = 13.55% I.E Moisture Content 2.6%
3. Silt Content = 3.77 % (It Shouldn't Exceed 8%)

C) AGGREGATES

1. Abrasion Test =9.5% (It Should be Less Than 18%)
2. Impact Load Test = 7.86% (It Should Less Than 45%)
3. Flakiness Index Test =8.56% (It Should Less Than 35%)
4. Water Absorption Test =1.2%(It Shouldn't Exceed 3%)
5. Specific Gravity Test =2.85 Range (2.5to3.0)

COMPRESSIVE STRENGTH TEST

Table 1 shows compressive strength of rubberized cement concrete cubes with 1% of replacement sand,

1% OF RUBBERISH CONCRETE CRUMB CUBE

No.	7 days	14 days	28 days
1	13.36	20.66	24.40

Table 2 showscompressive strength of rubberish cement concrete cube with 3% replacement of sand,

3% OF RUBBERISH CON CRETE CUBE

No.	7 days	14 days	28days
1	9.78	16.33	18.06

Table 3 compressive strength of conventional concrete cube,

CONVENTIONAL CONCRETE CUBE

No.	7 days	14 days	28 days
1	13.1	19.88	22.15

Table 4 compression in compressive strength,

COMPRESSION IN COMPRESSIVE STRENGTH

No.	7days	14 days	28 days
1	13.36	20.56	24.40
2	9.78	16.33	18.06
3	13.1	19.88	24.40

From the compression tables it was observed that strength was increase 9.78% with replacement of 1% of crumb rubber to the fine aggregate in concrete. But compressive strength was reduced by 18.06% with replacement of 3% of crumb rubber to the fine aggregate in concrete respectively

WATER ABSORPTION TEST

Table 1: trial 1

Specimen	Crumb(%)	Over Dry Mass(kg)	DryMass(kg)	Water absorption (%)
1	0%	2.325	2.60	11.94
2		3.377	2.64	11.3
3		2.136	2.43	13.43
AVERAGE				12.19

Table 2: trial 2

Specimen	Crumb (%)	OverDryMass(kg)	DryMass (kg)	Waterabsorption(%)
1	1.2%	2.309	2.60	10.44
2		2.288	2.53	9.65
3		2.183	2.38	8.5
AVERAGE				9.43

Table 3: trial 3

Specimen	Crumb (%)	OverDryMass(kg)	DryMass (kg)	Waterabsorption(%)
1	3.2%	1.982	2.151	8.03
2		1.844	1.192	8.22
3		1.855	1.191	7.41
AVERAGE				7.9

From the above table results it shows that concrete incorporated with rubber tyre crumb powder has been lower water absorption then ordinary concrete mix. The specimen with lowest water absorption was the one in which we replace 3%crumb to fine aggregate which had a water absorption rate of 7.9% which is less than conventional cube with water absorption rate of

BENEFITS

As we all know, about one crore 10 lacs of new vehicles are added each year to the Indian roads. Due to this, about 3 crores of tyres are been discardedby the vehicles users every year and causing a potential threat of the environment. Even if tyres are recycled yet a huge number of discarded tyres are been added to landfills or tyre dumps or construction as roof for waterproofing materials. This dumped waste rubber tyres can be used in Civil Engineering construction work or waterproofing work as well.

The following are some advantages of the treatment,

1) Utilization of waste material.
2) All materials are easily available.
3) Flexible material doesn't crack.
4) Having lower density, it can reduce the load on the roof
5) Treatment cost is about equal per square feet including labour as per traditional waterproofing techniques, which can further reduce if materials are purchased in bulks

4. CONCLUSIONS

From the above experiment, the following conclusion could be drawn,

- We are using the waste material and saving the environment to some extent and it is of free of cost and helpful for society
- Rubber concrete has a potential of reducing concretes water absorption as well as permeability
- Design mixture having less absorption than conventional concrete that it normally used in the construction industry
- It also has a higher rate of absorption then commercial concrete with water roofing chemical admixture.
- It has potential for waterproofing but concrete with admixture shows greater reduction of rate of reduction as well as permeability reduction
- Rubber concrete admixture has the lowest rate of absorption among the design mixes provided by the researchers.
- Compared to commercially used concrete for waterproofing incorporated by a chemical admixture, it has higher rate of absorption than that...

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