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EXPERIMENTAL STUDY ON CONCRETE BY USINGWASTE TONER CARTRIDGE POWDER AND FLEXBANNER AS PARTIAL REPLACEMENT OF CEMENTAND COARSE AGGREGATE

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INTRODUCTION

The use of toner powder and flex board in concrete is an innovative concept that is rapidly gaining recognition. As an eco-friendly and cost-effective alternative to traditional concrete, it offers many advantages. Toner powder and flex board can be used in large-scale projects, such as bridges and roads, as well as smaller projects, such as driveways and patios. Toner powder replaces the fine-grain aggregate that is usually added to concrete, while flex board replaces the coarse-grain aggregate. The use of these two materials provides a durable and strong concrete that is also aesthetically pleasing. Furthermore, the use of toner powder and flex board can help reduce the amount of cement that is needed, creating an overall cost savings. In addition, the lighter weight and increased stability of the combined toner powder and flex board concrete can help to reduce the amount of construction materials and labor needed for the project. Finally, the use of these materials helps to reduce environmental impact as they require fewer energy resources to manufacture. Overall, the use of toner powder and flex board in concrete is an ideal solution for any project, offering a combination of strength and beauty while reducing costs and environmental impact.

Concrete is a versatile construction material that has been used for centuries. It is strong, durable, and easily molded into different shapes and sizes, making it a favorite for a wide variety of projects. Recently, concrete has become even more versatile with the addition of toner powder and flex board in concrete. Toner powder is a type of powder that has a variety of benefits. It can increase the strength and durability of concrete, as well as provide a higher compressive strength. The use of toner powder in concrete can also help keep the material from cracking and chipping due to changes in temperature or other external factors.

Furthermore, toner powder can be colored to match any existing color scheme or aesthetic. Flex board in concrete is another material that offers an array of advantages. It is lightweight and flexible, allowing it to be used in locations where traditional concrete may not be feasible. Flex board in concrete is also non-flammable and environmentally friendly, making it a great option for projects that require a minimal environmental impact. Additionally, the material provides additional insulation and soundproofing, making any building better able to resist changes in temperature, as well as keeping noise levels low. Finally, flex board in concrete is also relatively easy to install and maintain, making it ideal for most projects. In conclusion, toner powder and flex board in concrete offer a wide range of benefits. From increasing strength and durability to providing additional insulation and soundproofing, these materials are a great addition to any construction project. They are easy to install and maintain, making them an ideal option for those looking to create something special. Not only will these materials make any project stronger, but they will also make it more environmentally friendly.

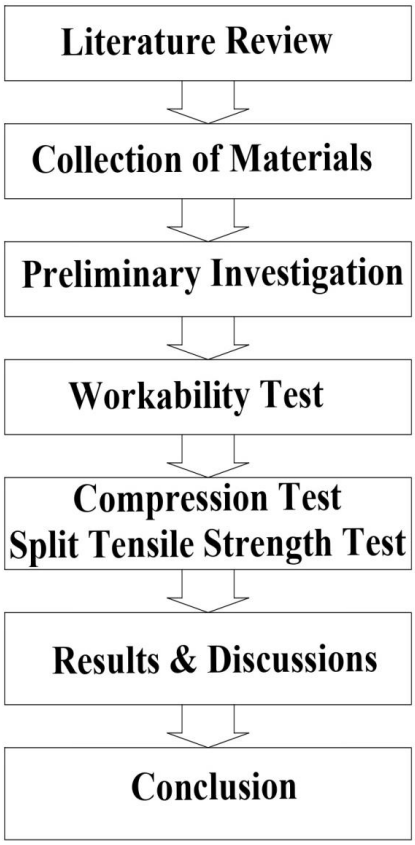
Concrete has long been a key material in construction, with its robust and durable nature making it a perennial favorite. However, as our construction processes have become more advanced and intricate, two materials have come to the fore—toner powder in concrete, and flex board in concrete. Toner powder is a fine powder composed of carbon black, iron oxide and other materials, typically added to concrete to increase its strength, durability and waterproofing properties. It can also

be used to change the color of concrete, providing an aesthetically pleasing finish. Flex board in concrete, meanwhile, is an adhesive-backed flexible material that can be added during the concrete mixing process. It provides concrete with increased flexibility and a greater ability to withstand expansion and

Contraction, making it an ideal choice for applications such as roads and paving. Toner powder and flex board in concrete can reduce the need for post-production repair and maintenance, thereby bringing down the cost of construction projects significantly. In addition, their use can improve the look and feel of a structure, making it far more aesthetically pleasing. Consequently, these materials have become an essential part of any modern construction project.

Using toner powder in concrete and flex board in concrete are both common methods of reinforcing concrete structures. Toner powder is a type of aggregate or small particle that can be mixed into concrete to add strength and durability to the structure. Flex board is a type of plastic or fiberglass mesh that is laid down within a concrete structure prior to pouring the concrete. Both of these materials have been used for decades to make robust, long-lasting structures, and both have their own sets of benefits and drawbacks. Toner powder is generally more economical to use and has the ability to increase the bond between the aggregate and cement, while flex board is more versatile and provides more surface area for bonding. Depending on the specific application, one or both of these materials can be used to make strong, capable structures. For instance, if a structure requires a lot of support and flexibility, the added strength of toner powder and the increased surface area of flex board may be ideal. On the other hand, if the structure is not meant to support a lot of weight, toner powder may be the better option due to its lower cost and easier installation. Ultimately, the choice between toner powder and flex board in concrete depends on the application, budget, and project requirements.

METHODOLOGY



RESULTS AND DISCUSSIONS

The workability and strength characteristics were evaluated by slumpflow test, compaction factor test and compressive strength tests on the different mixes. The effects of waste toner

cartridge powder and flex banneron the above said characteristics are discussed as below.

The results of slumptests, compaction fact or tests are tabulated. It wasfound the workability increased with increase in % of waste toner cartridge powder and flex banner. The time forspread of concrete increased with increase in % of waste toner cartridge powder and flex bannerdue to increase in internal friction of concrete& Cement mortor

The 7days and 28 days compressive strength of Cement mortor andthe7days compressive strength of Cement concrete were found by compression test on cubes and results are shown in table.A gradual increase in the strength was found with increase in waste toner cartridge powder and flex bannercontent. And there was no significant effect on workability and strength.

Designation of different mix:

Cement Mortor Cube:

Mix 1=5%waste toner cartridge powder
Mix 2 = 6%waste toner cartridge powder
Mix 3 = 7%waste toner cartridge powder
Mix 4 = 8% waste toner cartridge powder
Mix 5 = 9% waste toner cartridge powder
Mix 6= 10% waste toner cartridge powder

Cement Concrete Cube:

Mix 1 (10%flex banner)
Mix 2 (11%flex banner)
Mix 3 (12%flex banner)

Table 9.1- Slump Test

Sl.No	Mix	Flex banner (%)	Cement (%)	Slump in (mm)	Workability
1	M25	0	5	50	Medium
2	Mix-1	10	5	62	Medium
3	Mix-2	11	5	67	Medium
4	Mix-3	12	5	71	Medium

Fig 9.1.1slump Flow of Toner Powder & flex banner Mixture

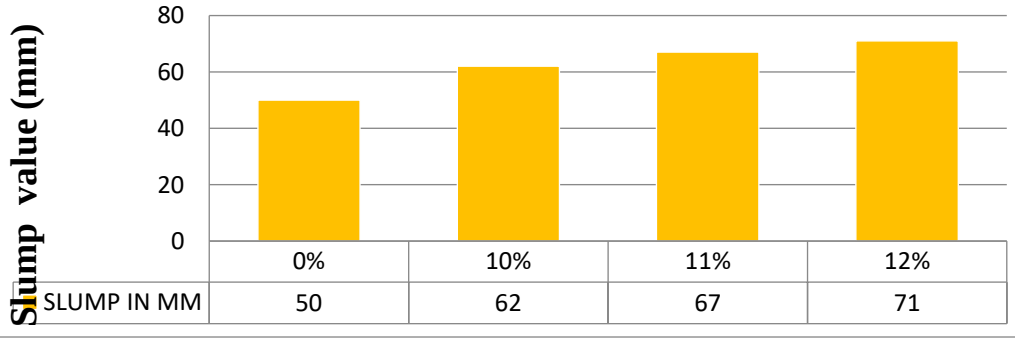


Table 9.2- Compaction Factor Test

Sl.No	Mix	W/C Ratio	Replacement		Mass with partially compacted concrete (Kg)	Mass with Fully compacted concrete (Kg)	Compaction Factor
			Toner Powder (%)	Flux Banner (%)			
1	M25	0.50	0	5	19	22	0.86
2	Mix-1	0.50	10	5	11.80	12.83	0.92
3	Mix-2	0.50	11	5	12.03	13.08	0.92
4	Mix-3	0.50	12	5	12.36	13.15	0.94

Fig 9.1.2Compaction factor of Toner Powder & flex banner Mixture

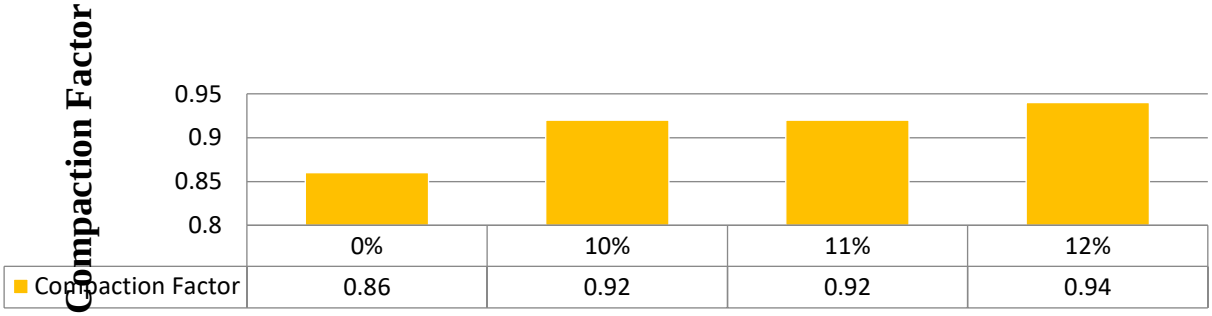


Table 9.3 Compressive test on Cementmortor cube

Sl.No	Mix	Replacment of Toner powder (%)	Average compressive strength at 7days N/mm²	Average compressive strength at 14days N/mm²	Average compressive strength at 28days N/mm²
1	M25	0	31.33	34	36
2	M1	5	35	36	38
3	M2	6	33	35	36
4	M3	7	31	33	35

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5	M4	8	30	32	33
6	M5	9	29	31	32
7	M6	10	28.53	29	30

Table 9.1.3- Compressive Strength Test on cement mortor of Toner powder Mixture

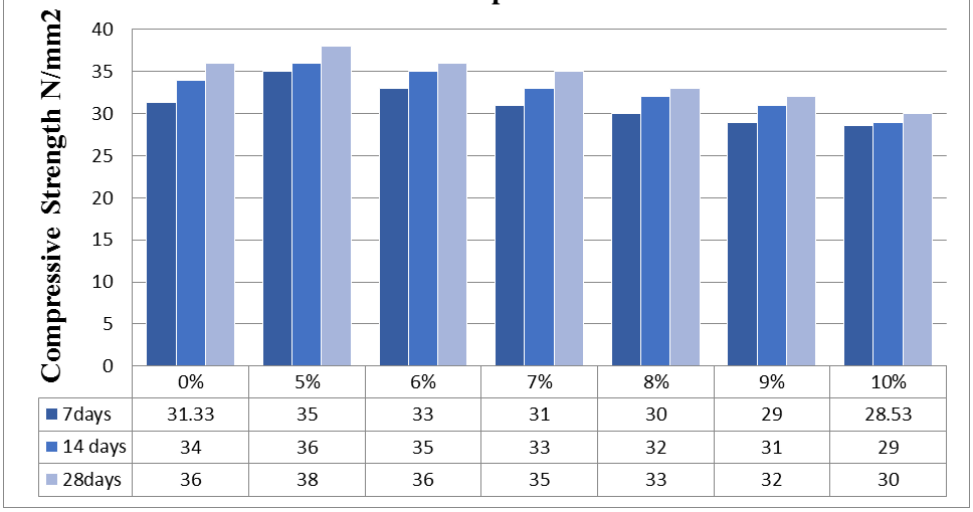

Table 9.4 Compressive test on concrete cube

Sl.No	Mix	Replacment		Average compressive strength at 7days	Average compressive strength at 14days	Average compressive strength at 14days
		Toner Powder (%)	Flux Banner (%)			
1	M25	0	0	17.13	21.06	25
2	M1	5	10	17.30	21.77	25.77
3	M2	5	11	17.62	22.48	26.54
4	M3	5	12	26.46	-	-

Table 9.1.4- Compressive Strength Test on concrete of Toner Powder & flux banner Mixture

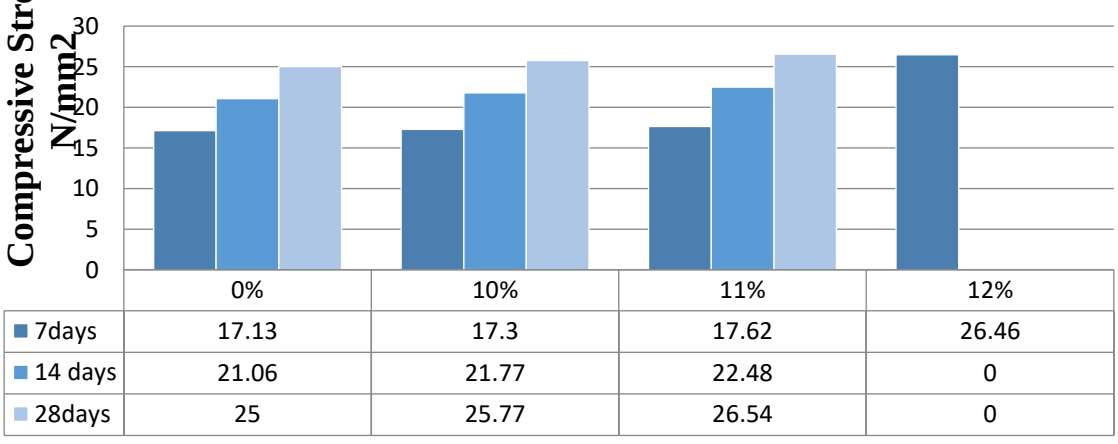

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Table 9.5- Split Tensile Strength

Sl.No	Mix	Replacment		Average Tensile Strength at 7 days (N/mm^2)	Average Tensile Strength at 14 days (N/mm^2)	Average Tensile Strength at 28 days (N/mm^2)
		Toner powder (%)	Flex Banner (%)			
1	NM	0	0	1.6	1.93	2.45
2	Mix-1	5	10	1.79	2.00	2.40
3	Mix-2	5	11	1.82	2.17	2.50
4	Mix-3	5	12	1.73	2.23	2.41

Table 9.1.5- Spilit Tensile Strength Test on concrete of Toner powder & flex bannerMixture

	0%	10%	11%	12%
7days	1.6	1.79	1.82	1.73
14 days	1.93	2.00	2.17	2.23
28days	2.45	2.40	2.50	2.41

CONCLUSIONS

our study has shown that toner powder can be a viable replacement for cement in mortar, offering improved physical properties and environmental benefits. While further research is needed to explore the long-term durability of toner powder mortar, our results suggest that it has great potential as a sustainable alternative in the construction industry.

We hope that our findings will inspire others to consider the use of waste products like toner powder in building materials, as a way to reduce waste and promote sustainability in the construction industry.

It is found that wrapping of waste flex banner significantly reduces the water absorption of concrete. As water absorption is one of the measures of durability of concrete, it can be inferred that durability can be significantly improved by wrapping of flex banner on concrete surface. This can find application in protecting existing concrete members exposed to adverse environment exposure. Exposed concrete members subjected to deterioration due to carbonation and other weathering actions specially in coastal region or in industrial areas can be protected to a great extent and made more durable by wrapping of waste PVC flex banners.

Wrapping of flex banner around concrete beams may hinder visibility of warning signs (in the form of cracks) during failure. Therefore, regions where cracks are likely to occur may be kept either unwrapped or wrapped with transparent PVC flex banner. Compression members like concrete columns may be fully wrapped with PVC flex banner.

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