# Experimental Investigation on Self Compacting Concrete By Using Marble Powder And Stone Powder

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***Abstract-*** *Stone is one of the most widely used building materials worldwide. Self-compacting concrete is a type of concrete that can flow evenly into the mold without separating or bleeding, self-compacting concrete, self- levelling concrete, high fluidity concrete stone or vibration-free stone are all quality concretes. Fluidity. It can also flow and compress medium weight in high- strength, tall structural members or complex molds without the effects of compression or vibration. This project, concrete etc. It can use some of the marble powder and stone powder in cement to make, save landfills and reduce carbon dioxide. It is best suited for compaction work in high-rise buildings where there is no vibration or external vibration. In this study, the best individual products can be produced with the addition of 10% (5% MP & 5% SP), 15% (7.5% MP & 7.5% SP) and 20% (10% MP & 10%). %SP). The waste industry can play an important role in replacing part of the stone to obtain environmentally friendly stone, and by improving the technology it can also reduce ecological pollution.*

***Keywords***- Self-compacting concrete (SCC), marble dust (MP), stone dust (SP), separation, processing, packaging, industrial waste.

## I. INTRODUCTION

Concrete is an important material in the world and is valued for its efficiency, economy and excellent struct ure, making it the first choice in the construction indust ry. It compresses cement, fine aggregate, coarse aggre gate and water. Besides all these ingredients, ingredient s can also be used to get the right mix. Cement is the main component of concrete and acts as a binding age nt. Compact concrete (SCC) has come a long way in th e field of construction since it was first developed in Japan by Okamura & Ozawa in 1988.

Self compression is the ability of new concrete to flow under its own weight for a long time without breaking down and to be completely compressed without the use of a vibrator. This saves time, reduces overall costs, i mproves the working environment and paves the way f or automation in construction. Marble powder and sto ne powder can be used in the self compacting concrete process, because the processin g of waste materials containing very fine dust from the marble industry is a slight problem of the global enviro nment nowadays. However, this information can be use d effectively and economically to improve some proper ties of new and hardened self- compacting concrete. Since the quality of marble powd er is very high, it is said that it can work well in providi ng good adhesion between mortar and stone. The comp ressive strength of stone powder is 14.76% higher than ordinary sand. Using stone dust in concrete both impro ves the quality of the stone and ensures the transfer of natural sand to future generations. The mixture of marb le dust and stone dust is 10% (5% MP & 5% SP), 15% (7.5% MP & 7.5% SP), 20% (10% MP & 10% SP).

## II. SCOPE OF THE PROJECT

- Use self- compacting concrete to make it possible to achieve success through crowded steel lines.
- Shorten project construction time.
- Reduced manual operation.
- Eliminate internal and external vibration for sealing.
- Establish good relations with the crowd.
- Do good things for the environment.

## III. OBJECTIVE OF THE PROJECT

- Identify the three main properties of self- compacting concrete, which are filling capacit y, penetrating capacity, and separation resistan ce.
- Use the concrete slump test and the Vee Bee test to determine the performance of self- compacting concrete.
- Examine the strength of self- compacting concrete under the influence of alkali. Study the application properties, strength and behaviour of marble powder and stone powder.

## IV. STUDY OF MATERIALS

### CEMENT

Cement can be defined as a sticky and sticky material t hat turns the crushed material into a solid. Grade 53 or dinary

Portland cement (chettinad) conforming to IS 8112 was used in this research.

**FINE AGGREGATE**

The fine sand used in the research is clean sand and meets the requirements of Region II. The sand is first sieved through a 4.75 mm sieve to remove particles larger than 4.75 mm. Fine aggregate shall comply with the requirements of IS 383.

**COARSE AGGREGATE**

The coarse aggregate used in the research is gravel aggregate passed through a 20mm sieve. Aggregate makes up 70- 80% of the total volume of ordinary stones. However, self-compacting concrete accounts for only 50% of the total concrete volume. Coarse aggregate shall comply with the provisions of IS 383-1970.

**WATER**

When water is added to cement, a paste is formed that binds all the materials together. The pH value of the water used for cement concrete should be between 6 and 8.5. For effective mixing the pH must be at least 6.

**CHEMICAL ADMIXTURE**

- Use additives such as water to effectively reduce the watercement ratio, control the setting time and flow of cement slurry.
- The effect of superplasticizers only lasts for 30 - 60 minutes, depending on the type and amount, and then it quickly loses its function.
- The total use of chemical additive is 6%.

**MARBLE POWDER**

As demand from the construction industry continues to grow, so does the demand for cement production; This creates a competitive environment as one ton of cement causes the emission of approximately one ton of carbon dioxide. Therefore, it is necessary to find other ways to reduce the environmental footprint.

**STONE POWDER**

Quarry waste fine aggregate, commonly known as gravel dust, creates environmental burdens due to disposalissues. Therefore, using crushed stone powder in the concrete mixture both reduces the need for natural sand and solves environmental problems.

## V. PROPERTIES OF MATERIALS

| S.no | Materials | Properties | Calculated value |
|---|---|---|---|
| 1 | CEMENT | Specific gravity<br>Standard consistency<br>Soundness test | 3.14<br>18%<br>20.94mm |
| 2 | FINE AGGREGATE | Specific gravity<br>Sieve analysis | 2.68<br>17.5% |
| 3 | COARSE AGGREGATE | Crushing test<br>Flakiness<br>Elongation index<br>Impact test value | 5.35%<br>14.57%<br>13.57%<br>29.75% |
| 4 | WATER | pH | 6-8 |
| 5 | MARBLE POWDER | Specific gravity | 2.57 |
| 6 | STONE POWDER | Specific gravity | 2.51 |

## VI. MIX DESIGN

| MATERIAL | PROPORTION |
|---|---|
| Cement | 1.65 Kg/m3 |
| Water | 0.748 L/m3 |
| Fine aggregate | 2.2 Kg/m3 |
| Coarse aggregate | 4.2 Kg/m3 |
| Super plasticizer | 0.07 L |
| Water-cement ratio | 0.40 |
| Marble powder | 371g/m3 |
| Stone powder | 495g/m3 |

## VII. FRESH CONCRETE TEST

Fresh concrete test is used to determine the following key properties of the concrete:-

1. Workability of the concrete
2. Water-cement ratio
3. Mix proportion of the concrete

**SLUMP CONE TEST**

It is used to determine the consistency of the concrete.

| CONCRETE MIX | SLUMP VALUE | SLUMP SHAPE |
|---|---|---|
| Normal mix | 25cm | True Slump |
| 10% mix | 11cm | Collision slump |
| 15% mix | 19cm | Shear slump |
| 20% mix | 18cm | Shear slump |

**Fig. No. 01 SLUMP CONE TEST**

**COMPACTION TEST**

This method is used to determine the workability test of the fresh concrete.
Compacting Factor = Weight of partially compacted/Weight of fully compacted

| CONCRETE MIX | COMPACTION VALUE |
|---|---|
| Normal mix | 0.97(high) |
| 10%mix | 0.78(very low) |
| 15%mix | 0.82(low) |
| 20%mix | 0.80(low) |

**VIII. HARDENED CONCRETE TEST**

Testing the solidification state of concrete is very impo rtant for monitoring and analyzing the quality of cemen t concrete work.

**COMPRESSION TEST**

Compression testing is the first test of hard concrete, m ainly due to its simplicity in performance and the fact t hat many properties of concrete are related to compress ive strength.

**Fig. No. 02 CONCRETE CURING**

**Fig. No. 03 COMPRESSION TESTING**

**GRAPHICAL REPRESENTATION**

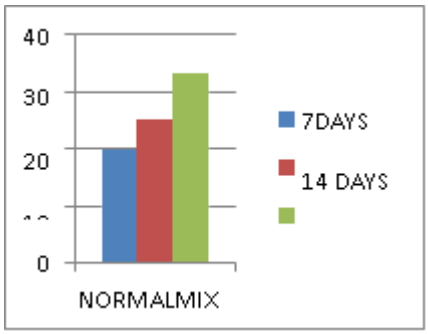


**Fig. No. 04 NORMAL MIX COMPRESSIVE STRENGTH (N/mm$^2$)**

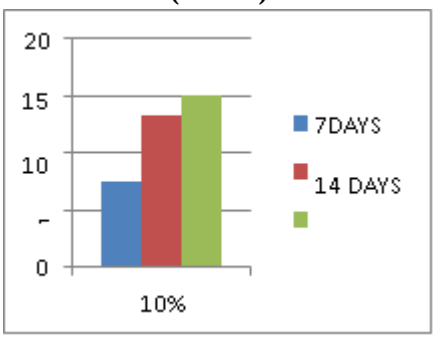


**Fig. No. 05 10% COMPRESSIVE STRENGTH (N/mm$^2$)**

| CONCRETE MIX | 7 DAYS (N/mm$^2$) | 14 DAYS (N/mm$^2$) | 28 DAYS (N/mm$^2$) |
|---|---|---|---|
| Normal mix | 20 | 25.1 | 33.11 |
| 10%mix | 7.5 | 13.5 | 15.11 |
| 15% mix | 19.5 | 27.5 | 40 |
| 20%mix | 23.11 | 26.66 | 30.0 |

**COMPARISON BETWEEN THE COMPRESSIVE STRENGTH**

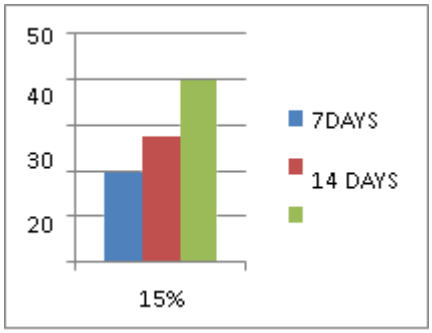


**Fig. No. 06 15% COMPRESSIVE STRENGTH (N/mm$^2$)**

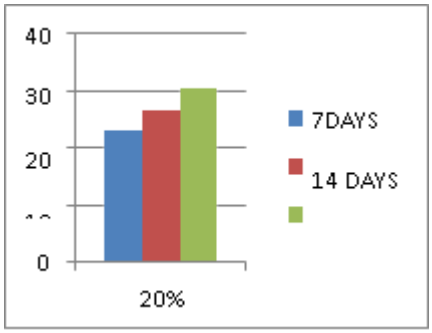


**Fig. No. 07 20% COMPRESSIVE STRENGTH (N/mm$^2$)**

## IX. RESULT AND DISCUSSION

- From the experiment, it can be seen that the ease of usegradually increases from 0% to 20 %. When the concrete loss is changed to 0%, 10%, 15% and 20%, the value increases by 25cm, 11cm, 19cm and 18cm respectively.
- Regarding capillary water absorption and immersion water absorption, water absorption is slightly increased when waste powder is used instead of cement.
- From the test results, it can be seen that the mechanical properties also change from 0% to 20%. The mechanical strength is reduced from 10% to 0%. At 15%, the mechanical equipment becomes twice as much as 10%, and at 20%, the mechanical equipment changes again.
- Finally, from the above results, we can see that the 15% mixture has a higher strength after 28 days, namely 40 N/mm$^2$; this corresponds to a 33.11N/mm$^2$ higher compressive strength of the same mixture after 28 days.
    - The curing rate is also higher.

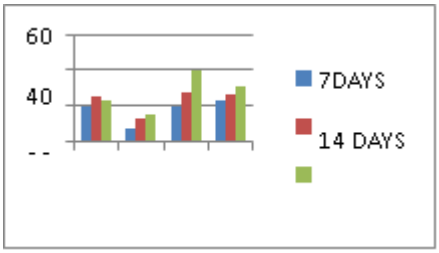


**Fig. No. 08 BAR GRAPH REPRESENTATION OF COMPRESSIVE STRENGTH (N/mm$^2$)**

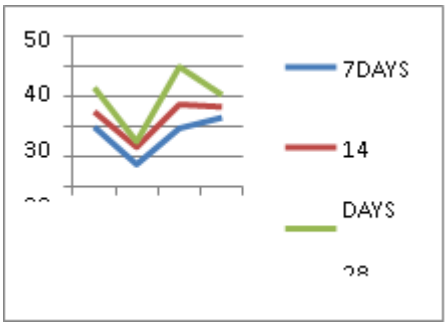


**Fig. No. 09 LINE GRAPH REPRESENTATION OFCOMPRESSIVE STRENGTH (N/mm$^2$)**

## X. CONCLUSION

- Selfcompacting concrete has excellent flow properties and can be easily poured by gravity without vibration. What distinguishes specialty stones from concrete is their properties that provide better flow and better stability when mixed.
- This test shows that marble powder and stone powder can be used as additives in self- compacting products. The test properties of the new selfcompacting stone show that it has satisfactory fluidity and good stability when the content of marble powder and stone powder reaches 20%.
- Marble powder and stone powder are added and a superplasticizer is used to obtain a homogeneous mixture without separation, characterized by ease of insertion into low density steel elements. In addition, self- compacting concrete containing marble powder and stone powder achieved compressi ve strength in the hardened state.
- Finally, it can be concluded that the addition of 15% marble dust and stone to self- compacting concrete is beneficial, which increases the compressive strength of the conc rete after 28 days of curing.
- It also improves the economy and environment of the organization.

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