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STUDY ON EFFECT OF COMBINATION OF ADMIXURE ON THE CHARACTERISTIC PROPERTIES OF SELF COMPACTING CONCRETE

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ABSTRACT

Around the world over, concrete is a material that is often used in construction. But nowadays, the requirements of the buildings its timeline and its applications have been changed. These changes require changes to be made in the concrete also. As a result, self-compacting concrete was discovered by the scientist. This article discusses the uses, advantages of self-compacting concrete and give sits brief introduction for understating its basics. Also, to increase the properties of concrete some admixtures are added, like mineral, fibre or chemical admixtures. They can be silica fume, steel slag, plasticizers, etc. all these admixtures have different properties as per the requirements. The studies include the topic of admixtures in self-compacting concrete as well. Additionally, iron slag and rice husk ash have been mentioned. In this research, the appearance of concrete prepared without cement and with different admixtures is compared. Here, silica fume, rice husk ash, and other mineral additives are used. Some cement can be replaced with iron slag. They are all substantial industrial wastes. These materials, which have high quantities of silica and pozzolanic components, are used for a variety of purposes today. Make excellent content; it is used as a cement alternative. Compressive and flexural strengths, the two primary features of concrete are those that are determined for hardened concrete to examine load bearing capacity for design reasons. In this work, we examined the overall effect of admixtures on the self-compacting concrete's properties. Various samples were cured for 28 days as part of the experiments. The materials' compressive strength, flexural strength, and tensile strength were examined using various methods. As a result, a comparison research is highly valuable for determining the sort of minerals admixtures to be employed.

Keywords: RHA (Rice Husk Ash), SF (Silica Fume), IS (Iron Slag), Split Tensile Strength, Flexural Strength, Compressive Strength, Etc.

I. INTRODUCTION

Self-Compacting Concrete

In 1980, self-compacting concrete was invented in Japan. Professor H. Okamura from the University of Tokyo, Japan, who is now known as the father of SCK, is responsible for the origin and early development of this concrete. In the 1980s, Japan's lack of skilled labor and labor necessitated the creation of DKK. It is the biggest technological leap and the most fundamental innovation in concrete technology since at least the 1980s. Although SCC was originally developed to address the shortage of trained manpower, SCC has been shown to not only reduce labor requirements but also produce more durable and user-friendly concrete. Due of its consistent perfection in both quantity and quality, it is crucial to the construction industry. Today, many countries like Canada, Sweden, Netherlands, USA, Austria, Korea and others use it. One of the most commonly used types of concrete is self-compacting concrete (SCC), sometimes called self-compacting concrete. In its fresh state, SCC exhibits exceptional flow characteristics, self-compaction and material consolidation without separation.

Self-Compacting Concrete Characteristics

- Self-compacting concrete and conservative vibrating concrete have comparable compressive strength properties. Therefore, SCC can be used in most applications that use conventional precast concrete.
- The composition of DKK is different from ordinary concrete, but the difference only affects its performance in the new phase; has no effect on solid state properties.
- Because of the high interface between the aggregate and the hard paste due to the lack of vibration, self-compacting concrete is slightly stronger than conventional vibrated concrete with the similar water-cement or cement-binder ratio.

- SCC differs from conventional concrete in that its ability to place properly depends on the new properties of the material.
- Workability characteristics that affect fill capacity, throughput, and separation resistance must be carefully managed to ensure that putability remains adequate.
- Concrete "fallibility" refers to its ability to move freely underweight without intentional vibration.
- Permeability of concrete refers to its ability to maintain uniformity. Buildings with compacted areas can go through SCC without creating honeycombs.
- This refers to the concrete's resistance to segregation as it moves through the self-compacting process. Self-compacting concrete (SCC) has an exclusive blend of mineral fillers that make it resistant to cracking.

Fig. 1 Self-Compacting Concrete

Fig. 2 Powdered silica fume

Rice Husk Ash

The most important part of any building and the most used material in construction is concrete. The choice of concrete is influenced by many factors, including environmental, energy consumption, financial and technical considerations. To reduce construction costs, alternative building materials that can meet these requirements and are available locally are being developed due to special technological advances. For this, a variety of materials are employed, including fly ash, silica fume, rice husk and ground granulated furnace slag (GBF). All these fall into the category of pozzolanic mixtures, also known as mineral mixtures. It is also called additive cement material.

Fig. 3 Powder rice husk ash

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Fig. 4 Iron slag

II. OBJECTIVES

- To study different types of admixtures used in the concrete specifically in self-compacting concrete.
- To learn about self-compacting concrete and its properties.
- To analyze the influence of admixtures in self-compacting concrete and its results in its properties and compositions.

III. METHODOLOGY

Discuss about concrete experimentation in this part of the report. Describe the cement, aggregate, and admixtures used to prepare the sample as well. Additionally, it offers sample mix formulations. Concrete testing is done at various phases, first with a slump test when the concrete is still new, and then with flexural strength, compressive strength, and tensile strength test when the concrete has hardened.

Fig. 5 Slump Flow Experimental Work

Fig. 6 Compressive Strength Test

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IV. RESULTS AND ANALYSIS

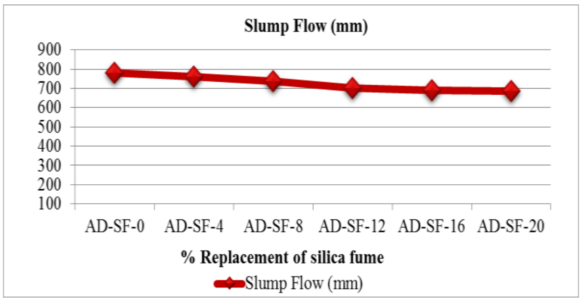

Fig. 7 Slump Flow of concrete partial replacement of cement with silica fume

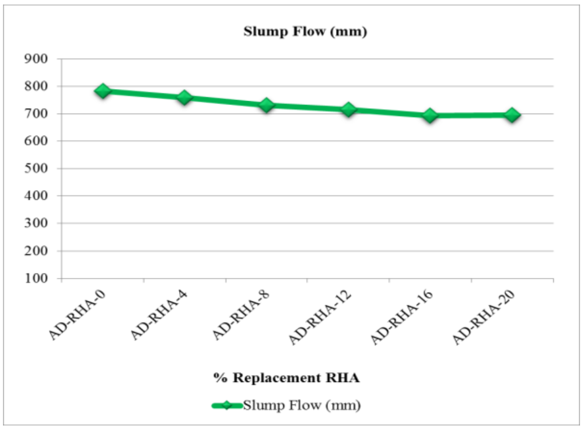

Fig. 8 Slump Flow of concrete partial replacement of cement with RHA

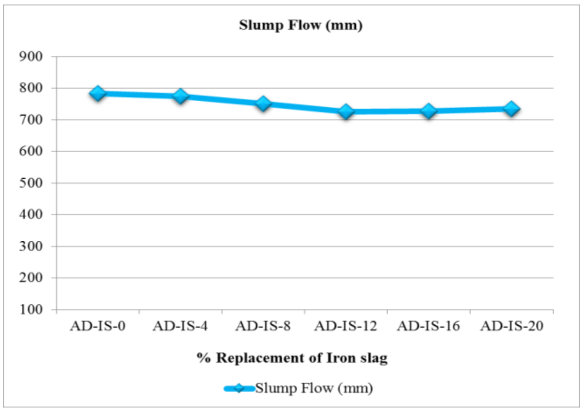

Fig. 9 Slump Flow of concrete partial replacement of cement with Iron slag

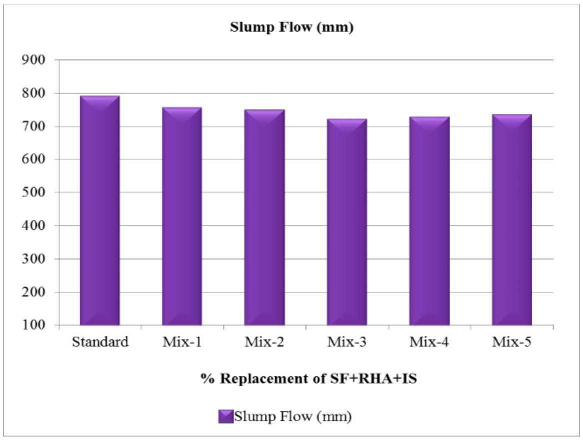

Fig. 10 Slump Flow of concrete partial replacement of cement with SF+RHA+IS

Compressive strength

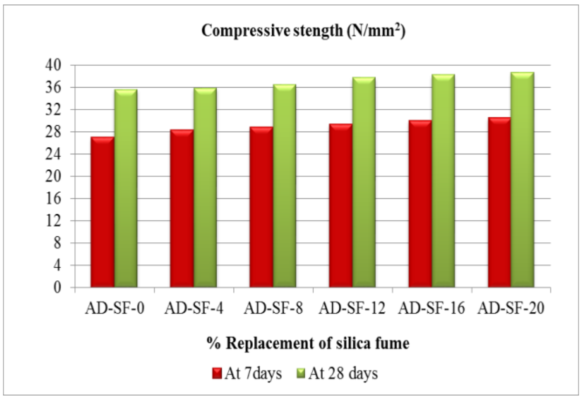

Fig. 11 7 and 28 days Compressive strength cause from concrete partial replacement of cement with silica fume

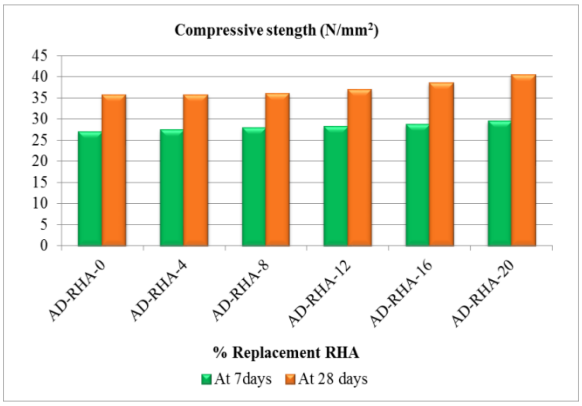

Fig. 12 7 and 28 days Compressive strength cause from concrete partial replacement of cement with RHA

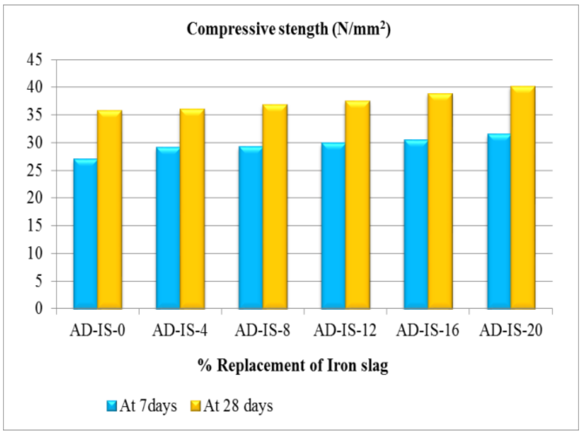

Fig. 13 7 and 28 days Compressive strength cause from concrete partial replacement of cement with Iron slag

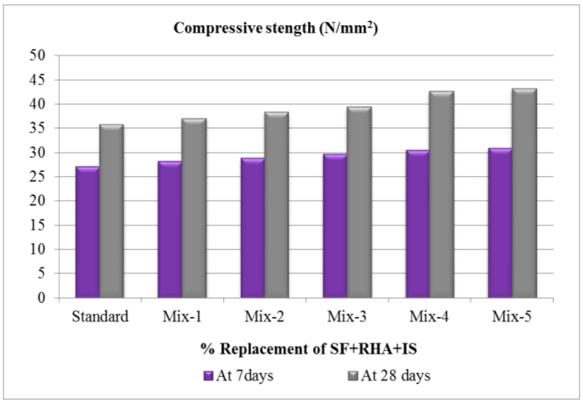

Fig. 14 7 and 28 days Compressive strength cause from concrete partial replacement of cement with SF+RHA+IS

Flexural strength

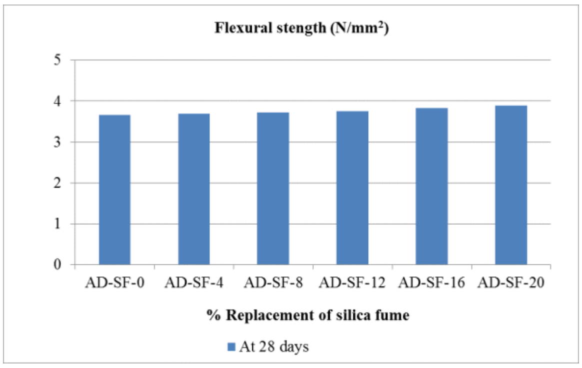

Fig. 15 28 days Flexural strength cause from concrete partial replacement of cement with silica fume

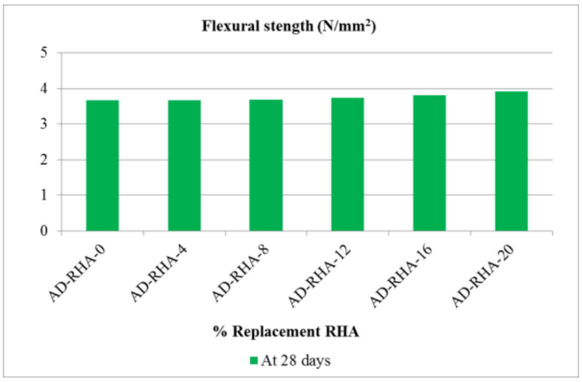

Fig. 16 28 days Flexural strength cause from concrete partial replacement of cement with RHA

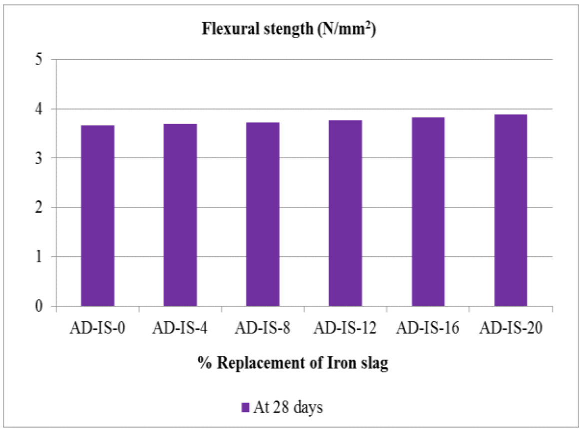

Fig. 17 28 days Flexural strength cause from concrete partial replacement of cement with Iron slag

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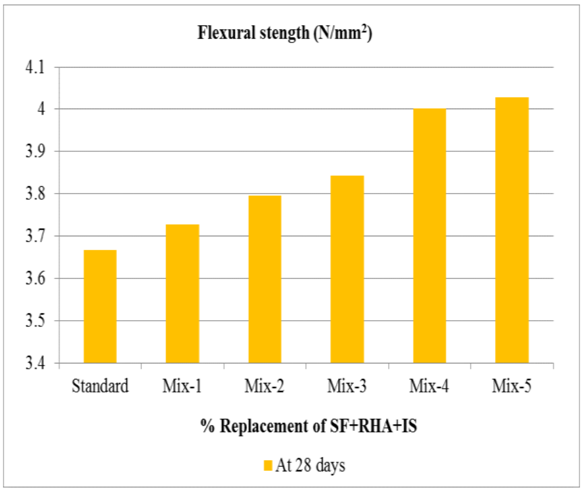

Fig. 18 28 days Flexural strength cause from concrete partial replacement of cement with SF+RHA+IS

Split tensile strength

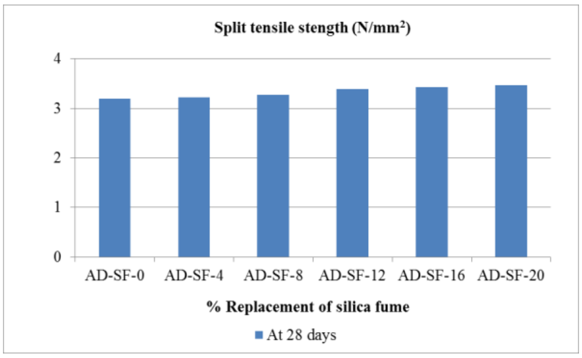

Fig. 19 28 days Split tensile strength cause from concrete partial replacement of cement with silica fume

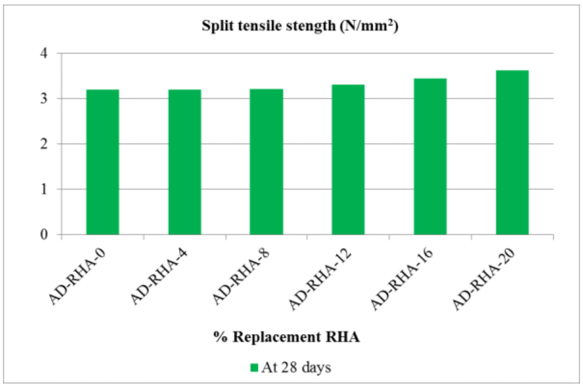

Fig. 20 28 days Split tensile strength cause from concrete partial replacement of cement with RHA

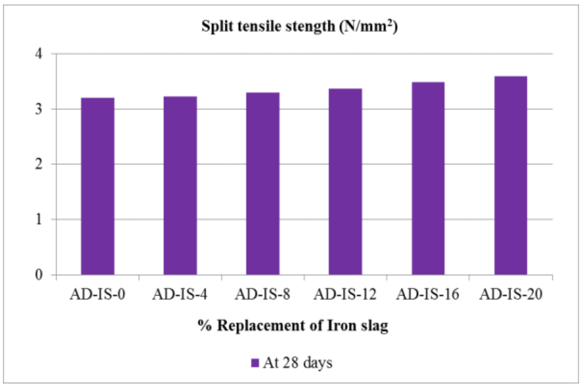

Fig. 21 28 days Split tensile strength cause from concrete partial replacement of cement with Iron slag

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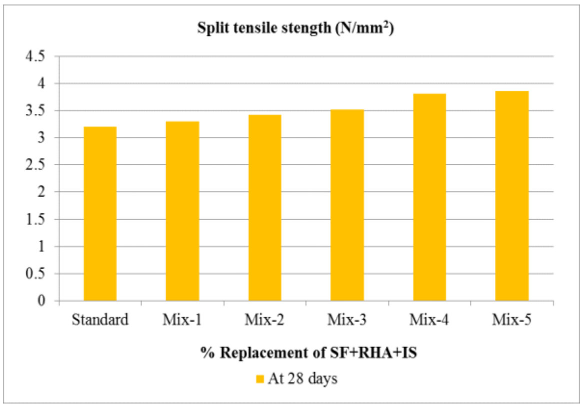

Fig. 22 28 days Split tensile strength cause from concrete partial replacement of cement with SF+RHA+IS

V. CONCLUSION

- For a regular concrete sample, the maximum slump flow is 783mm, however with the addition of silica fume, the maximum slump flow drops to 687mm. Up until the addition of silica fume, there was a 12% substantial shift in slump flow. After that, values altered, but the changes were gradual.
- For a regular concrete sample, the maximum slump flow is 783mm, however with the addition of RHA, the maximum slump flow drops to 693mm. Up until the addition of RHA, there was a 12% substantial shift in slump flow. After that, values altered, but the changes were gradual.
- For a regular concrete sample, the maximum slump flow is 783mm, however with the addition of IS, the maximum slump flow drops to 726mm. Up until the addition of IS, there was a 0% substantial shift in slump flow. After that, values altered, but the changes were gradual.
- For a regular concrete sample, the maximum slump flow is 783mm, however with the addition of IS, the maximum slump flow drops to 713mm. Up until the addition of IS, there was a 0% substantial shift in slump flow. After that, values altered, but the changes were gradual.
- When use all three different type of mineral admixture value of slump flow till 36% addition value goes down but after that this value start rising up.

Compressive strength

- Maximum value of compressive strength at 7 days in standard sample is 26.92 N/mm2 but due to addition of silica fume compressive strength goes higher as addition of silica fume. At 20% addition of silica fume compressive strength of sample is 30.37 N/mm2.
- Maximum value of compressive strength at 28 days in standard sample is 35.68 N/mm2 but due to addition of silica fume compressive strength goes higher as addition of silica fume. At 20% addition of silica fume compressive strength of sample is 38.73 N/mm2.
- Maximum value of compressive strength at 7 days in standard sample is 26.92 N/mm2 but due to addition of RHA compressive strength goes higher as addition of RHA. At 20% addition of RHA compressive strength of sample is 29.44 N/mm2.
- Maximum value of compressive strength at 28 days in standard sample is 35.68 N/mm2 but due to addition of RHA compressive strength goes higher as addition of RHA. At 20% addition of RHA compressive strength of sample is 40.46 N/mm2.
- Maximum value of compressive strength at 7 days in standard sample is 26.92 N/mm2 but due to addition of IS compressive strength goes higher as addition of IS. At 20% addition of IS compressive strength of sample is 31.37 N/mm2.
- Maximum value of compressive strength at 28 days in standard sample is 35.68 N/mm2 but due to addition of IS compressive strength goes higher as addition of IS. At 20% addition of IS compressive strength of sample is 40.11 N/mm2.
- Maximum value of compressive strength at 7 days in standard sample is 26.92 N/mm2 but due to addition of SF+RHA+IS compressive strength goes higher as addition of SF+RHA+IS. At 60% addition of SF+RHA+IS compressive strength of sample is 30.73 N/mm2.

- Maximum value of compressive strength at 28 days in standard sample is 35.68 N/mm2 but due to addition of SF+RHA+IS compressive strength goes higher as addition of SF+RHA+IS. At 60% addition of SF+RHA+IS compressive strength of sample is 43.04 N/mm2.

Flexural strength

- Maximum value of Flexural strength at 28 days in standard sample is 3.668 N/mm2 but due to addition of silica fume Flexural strength goes higher as addition of silica fume. At 20% addition of silica fume Flexural e strength of sample is 3.889 N/mm2.
- Maximum value of Flexural strength at 28 days in standard sample is 3.668 N/mm2 but due to addition of RHA Flexural strength goes higher as addition of RHA. At 20% addition of RHA Flexural strength of sample is 3.906 N/mm2.
- Maximum value of Flexural strength at 28 days in standard sample is 3.668 N/mm2 but due to addition of IS Flexural strength goes higher as addition of IS. At 20% addition of IS Flexural strength of sample is 3.889 N/mm2.
- Maximum value of Flexural strength at 28 days in standard sample is 3.668 N/mm2 but due to addition of SF+RHA+IS Flexural strength goes higher as addition of SF+RHA+IS. At 60% addition of SF+RHA+IS Flexural strength of sample is 4.028 N/mm2.

Split tensile strength

- Maximum value of Split tensile strength at 28 days in standard sample is 3.197 N/mm2 but due to addition of silica fume Split tensile strength goes higher as addition of silica fume. At 20% addition of silica fume Split tensile strength of sample is 3.470 N/mm2.
- Maximum value of Split tensile strength at 28 days in standard sample is 3.197 N/mm2 but due to addition of RHA Split tensile strength goes higher as addition of RHA. At 20% addition of RHA Split tensile strength of sample is 3.625 N/mm2.
- Maximum value of Split tensile strength at 28 days in standard sample is 3.197 N/mm2 but due to addition of IS Split tensile strength goes higher as addition of IS. At 20% addition of IS Split tensile strength of sample is 3.594 N/mm2.
- Maximum value of Split tensile strength at 28 days in standard sample is 3.197 N/mm2 but due to addition of SF+RHA+IS Split tensile strength goes higher as addition of SF+RHA+IS. At 60% addition of SF+RHA+IS Split tensile strength of sample is 3.856 N/mm2.

VI. FUTURE SCOPE OF THE WORK

- More recycled aggregate will be used in this job in the future.
- To examine M40 and M50 grade of concrete, as well as any upcoming research work.
- Non-destructive testing is also carried out on these samples, and the findings are studied.
- This study and subsequent ones using plastic waste as a replacement material will use metakaolin.

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