

Effect of Nano Silica on Compressive Strength of Concrete

Rutuja Mininath Sarade¹ Suraj Ramesh Shinde² Rohan Kantilal Wayase³

Namdev Babu Rajguru⁴ Dr. P. D. Nemade⁵

^{1,2,3,4,5}S B Patil College of Engineering Indapur, Pune, India

Abstract— This paper reviews the recent developments and present state of application of Nano silica in concrete technology. The application of Nano silica in concrete not only save the resources and energy but also protect the environment from the pollution with the reduction of waste material and reduction of CO₂ emission. The study of this paper concern with the use of Nano silica in concrete and to improve the compressive strength of concrete. This paper shows the partial replacement of cement with the Nano silica with different doses like 1%, 1.5%, and 2% by weight and increase the strength property of concrete and also shows that the comparative study between the concrete without addition of Nano silica and with addition of Nano silica. Nano concrete gives the more effective result than the ordinary concrete. The result of this paper gives the increase in compressive strength of concrete by the application of Nano silica

Key words: Nanotechnology, Nano concrete, compressive strength, Nano silica

I. INTRODUCTION

In recent year Nanotechnology is used in everywhere also in construction site. Construction site Nano technology means use Nano material i.e.; Nanosilica in concrete and to improve the strength properties of concrete. Nano silica is used in production of concrete and improves the performance of concrete. In concrete cement is the binder material and it binds the other material together. But one disadvantage of application of cement is it emits the large amount of CO₂ in environment and pollute them. To avoid this pollution use a Nano concrete means to replace the cement by the different doses of Nano silica by weight. Nano silica is one of the best Nano material to improve the different strength, physical, and mechanical properties of concrete than the other Nano material. Nano silica is effectively high pozzolanic material. The size of Nano silica is 1000 times smaller than the average size of cement particle. Nano silica reduces the setting time and improves the compressive strength of concrete. There are different methods for production of Nano silica. Use Nano silica in concrete and do the comparative study between the conventional concrete and Nano concrete and select most preferable between them. The aim of this paper is to do the comparative study to do the comparative study between conventional and Nano concrete and find out the improvement in compressive strength of concrete.

II. LITERATURE REVIEW

- Sakshi Gupta (2013) “Application of Silica Fume and Nano silica in cement and concrete – A Review”-

This review paper shows that not only save the resources and energy but also protection of environment from the pollution i.e. from CO₂ emission with the application of Nano silica in concrete.

- Jugal Mistry, Indrajit Patel, Jagruti Shah (2014) “Study on Effect of Nano materials on various Properties of Concrete”-

Cement is the major raw material in production of concrete. At the time of manufacturing of cement, large amount of CO₂ emitted in atmosphere. CO₂ is harmful to the atmosphere. So it is required to use green concrete i.e. Nano concrete and protect the environment.

- K.V.Priya, D. Vinutha (2014) “Effect of Nano Silica in Rice Husk Ash Concrete”-

This paper suggests a method to reduce the cement content in concrete and reduces the CO₂ emission. Also gives the idea about production of Nano silica from rice husk ash (RHA). After application of Nano silica to check the compressive strength of concrete.

- Celik Ozyildirim, Caroline Zegetosky (2010) “Laboratory Investigation of Nano materials to improve the Permeability and Strength of Concrete”-

Concrete contain different additional material like Nanomaterial for improving strength of concrete. Nano material having ‘small size and large surface area’ it gives the more compressive strength.

- DR.M. Rame Gowda, MR. Susheel S. M, MR. Naveen M, MR. Avinash H. K, MR. L Banchanlang Shullet “Study of behavior of Nano concrete”-

The aim of this paper is application of Nano silica in concrete and focusing the different properties of Nano silica.

- Yuvaraj Shanmugasundaram, Dinesh Nagarajan, Karthic Ramachandran, Dr. Suji Mohankumar(2012) “Experimental Study on the Influence of Nano silica in the Strength and Durability of Concrete”-

This paper suggests the partial replacement of ordinary Portland cement by Nano silica and reduces the environmental impact, improves the strength properties of concrete.

- Jonbi, Ivindra Pane, Binsar Hariandja, Iswandi Imrans (2012) “The Use of Nano silica for Improving of Concrete Compressive Strength and Durability”-

This paper shows the, on construction site Nano concrete is rapidly used and mainly Nano silica is used as a Nano material and improving the different properties of concrete.

III. AIM AND OBJECTIVE

A. Aim:

The aim of project is to find the compressive strength of concrete before and after the application of Nano silica and select the most suitable concrete which is economical, durable and achieve goal of project.

B. Objective:

- To find compressive strength of concrete by using conventional concrete and Nano concrete.

- Reduces the CO₂ emission in environment and protect the environment from pollution.

IV. METHODOLOGIES

The methodology that will be used it accomplished the objectives listed above can be divided into three distinct phases comprising five distinct tasks.

The phases are:

- 1) Preparation
- 2) Analysis
- 3) Synthesis

The first step of study will be the identified basic information of the Nano silica powder.

The second step will be to study existing literature available and also analysis the collected data. Select the suitable, economic data and use in a concrete for improving their properties.

The third step will be to forecast the cubes with suitable mix design method. Select the proper and well proportional ingredient which improves the properties of Nano silica.

A. Proposed Work:

The following work is decided to be carried out:

- 1) Phase-1 in this phase collect the basic information related to Nano silica such as their properties, advantages, disadvantages, latest application of nano silica in construction site economy of the construction by using Nano silica etc. Also find time required to complete the project.
- 2) Phase-2 in this phase, carefully analysis the collected data. Select the useable data which improve the compressive strength of concrete and also this data should be economical. Also select the proper mix design with proportion of ingredient.
- 3) Phase-3 in this phase, by using proper mix design prepare the different cubes (i.e. without Nano silica and with varying percentage of Nano silica) with selected proportion of ingredients. Taking the compressive test on that cubes and note down the readings. Analysis the result and select proper concrete (i.e. without Nano silica and with Nano silica).

The goal of proposed work is to study the compressive strength of concrete by application of Nano silica. Above work will be shown how the methodology can be converted to practice.

V. RESULTS ATTAINED

| Sr.no. | W/C ratio | Addition of NS in % | Compressive strength in N/mm ² | | | % increase in compressive strength |
|--------|-----------|---------------------|---|--------|---------|------------------------------------|
| | | | 3 days | 7 days | 28 days | |
| 1 | 0.35 | 0 | 34.2 | 50.23 | 65 | - |
| 2 | | 1 | 37.72 | 55.40 | 71.69 | 10.3 |
| 3 | | 1.5 | 39.33 | 57.76 | 74.75 | 15 |
| 4 | | 2 | 40.84 | 59.92 | 77.63 | 19.43 |

Table 1:

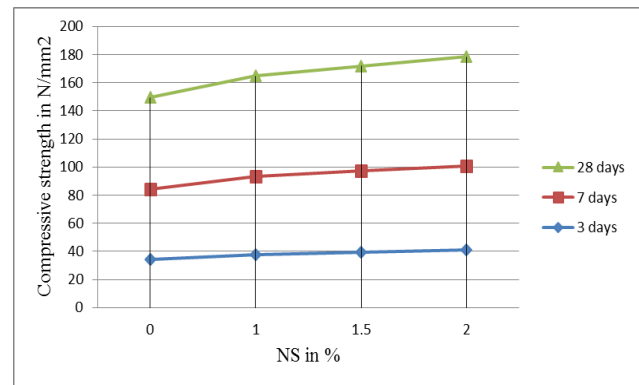


Fig. 1:

VI. CONCLUSIONS

- By the application of Nano silica in concrete reduces the CO₂ emission in environment and protects the environment from pollution.
- Average percentage increase in strength of concrete after 3 days, 7 days, and 28s days is 10.3%, 15%, and 19.43% with respect to doses.

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