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# Effect of Fuel Injection Pressure and Injection Timing on Performance and Emissions of Diesel Engine Using Nanoadditive Blends

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## Research Article

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**ABSTRACT**

Concrete is individual and mainly extensively worn building substance. It's regularly linked through Portland cement since the core structural members intended for the building concrete. The normal (OPC) cement traditionally old because the major file towards manufactures the concrete material. This is a compound substance consisting of a medium contain an arbitrary sharing or spreading of minute fiber, also ordinary. It's produced with a grouping and a partial mixture of coarse aggregates. The nominal design mix is accessible in addition to scope used. The GFC facilitates to bestow this exclusive compound concrete material its strength. The current laboratory examination of glass fibers has been used to learn (the result resting on compressive, flextural and split tensile strength lying on) Mix proportions 20 (1:1.5:3) (grade of concrete through) an add unreliable proportion of glass fiber. Which coarse aggregate replaced with glass fiber as 20%, 30%, 40%. The compressive strength of curing aging 7, 28-Days. And attained required strength of cast specimens

## INTRODUCTION

The glass fiber concrete structural panels proceeds from a statement of its basic properties in tensile, compressive, bending and shear forces, joined through analyses of behavior under consequential loading effects and such as creep, Thermal reactions and humidity movement[1,2]. There is a numeral of differences flanked by structural metal and fiber reinforced composites. For design, metals and glass is universal exhibit yielding and plastic strength, stress & strain characteristics. On the other hand, the unrelated nature of the materials provides[3] high mechanical strength[4,5]. Depending upon the kind and rigorousness of external impact loads. Mechanisms of damage development and growth in other composite structural elements are also fairly dissimilar other important characteristics of glass fiber reinforced composites are their non-corroding behavior, lofty damping capability and squat coefficients of thermal expansion[2,6].

Glass fiber reinforced concrete architectural panels, structural element contains the wide-ranging appearance of precast (post tensioning and pre tensioning) concrete structural elements[7], Excluding differ in some important behavior. For instance, the GFC structural precast members, on standard, consider significantly less than precast concrete structural element due to their reduced thickness and attain the retaining strength. (The manufacture the cast in low down weight) panels (decreases loads superimposed on the building's structural components. The building frame) component members (becomes) are (more economical.) Strong point (of GFRC is developed due to high contents of alkali resistant glass fibers and acrylic polymer) materials[6]. In view of the fact that (the cement contents are high,) and the water/cement (ratio) is low, The GFC strength under compressive, split tensile, Flextural strength loads are high[2,8,9]. These resources also possess great tensile and flexural strength. The fiber course determines the efficiency of fiber resistance to loads. The fiber should be rigid to guarantee the provision of essential tensile strength. Thus, the concert of these materials is better than the normal concrete. The physical property of GFRC structure is improved than the strength of unreinforced normal concrete[6]. The Glass fiber reinforced concrete that has been suitably designed and considerably increases the strength of produced that are cast with GFC[1,10]. The characteristics focus of the glass fiber percentage replacement of coarse aggregate. To study mechanical strength of compressive, tensile, flextural strength of concrete along with glass fiber as partial replacement for coarse aggregate in concrete.

# MATERIALS AND METHODS

### Materials

### Cement

53 Grade (OPC) cement be required to be convened. And refereed BIS specification IS:12269-1987 with a designed strength for 7, 28 days being a minimum range of 53 MPa or 530 kg/cm$^2$.

### Coarse aggregate

Crushed angular gravel stones from a local source was used as coarse aggregate. (20mm sizes)Fine aggregate:

M- Sand was used as fine aggregate. The specific gravity of fine aggregate is 2.55 and fineness modulus of fine aggregate was 2.93.

### Glass fibers

Small bunch cut pieces of glass fiber rods. (20 mm sizes)**(Table 1)[**[11]

**Table 1.** Glass fiber mechanical properties.

| | |
|---|---|
| Specific gravity | 2.62 |
| Tensile modulus (GPa) | 81.3 |
| Tensile strength (MPa) | 3450 |
| Tensile elongation, % | 4.9 |
| Specific modulus (GPa) | 31 |
| Specific strength (MPa) | 1310 |
| Longitudinal coefficient of thermal expansion K | 5 |

# METHODS

### Mix Sroportioning

The target compressive strength, split tensile strength, flextural strength of M20 mix was calculated according to IS: 10262 2009 for 7, 28-Days. The water cement ratio, fine aggregate, coarse aggregate content was taken about as per IS code 12.

### Mix Preparations

Preparation of concrete mix is M20 mix design. The water/cement ratio having concrete mix 0.57 was prepared consideration of humidity conditions. Weight batching methods are followed by concrete mix preparations. The Mix was tested by (workability & consistency) soundness the result. The mix specimen for cast for 7-28 days. A minimum of 3 specimens was cast for a single test to analyze. The whole procedure was carried at room temperature. Compacting of concrete was carried with the help of vibrating machine.

### Test Specimens

Test specimens consisting of 150 × 150 × 150 mm cubes for Compressive strength, 150mmΦ, 300mm length cylinders for split tensile strength and 150 × 150 × 700 mm beam for flexural strength using different percentage glass fiber for M20 grade of concrete mix were cast and tested as per IS: 516 and 1199.

**Table 2.** Compressive strength for M20 grade of concrete mix with different % of glass fiber..

| Grade | No of days | Compressive strength of concrete (OPC) | 20% GF | 30% GF | 40% GF |
|---|---|---|---|---|---|
| M20 | 7-Days | 22N/mm$^2$ | 24.5N/mm$^2$ | 27N/mm$^2$ | 31N/mm$^2$ |
| | 28-Days | 30N/mm$^2$ | 32.75N/mm$^2$ | 35N/mm$^2$ | 38.5N/mm$^2$ |

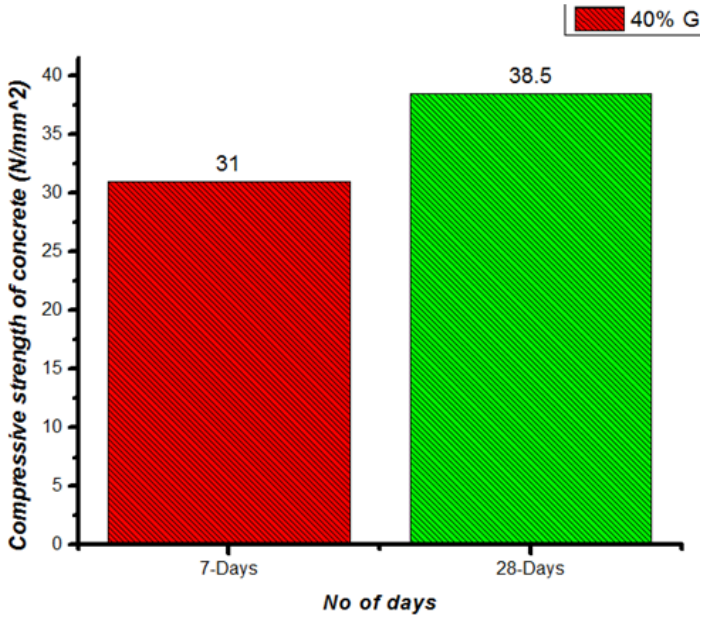


**Figure 1.** Compressing strength of concrete cubes on 7-days & 28-days.

**Table 3.** Flexural strength for M20 grade of concrete mix with different % of glass fiber.

| Grade | No of days | Flextural strength of concrete (OPC) | 20% GF | 30% GF | 40% GF |
|---|---|---|---|---|---|
| M20 | 7-Days | 2.5N/mm$^2$ | 4.65N/mm$^2$ | 5.35N/mm$^2$ | 6.5N/mm$^2$ |
| | 28-Days | 4N/mm$^2$ | 6.78N/mm$^2$ | 7.45Nmm$^2$ | 8.65N/mm$^2$ |

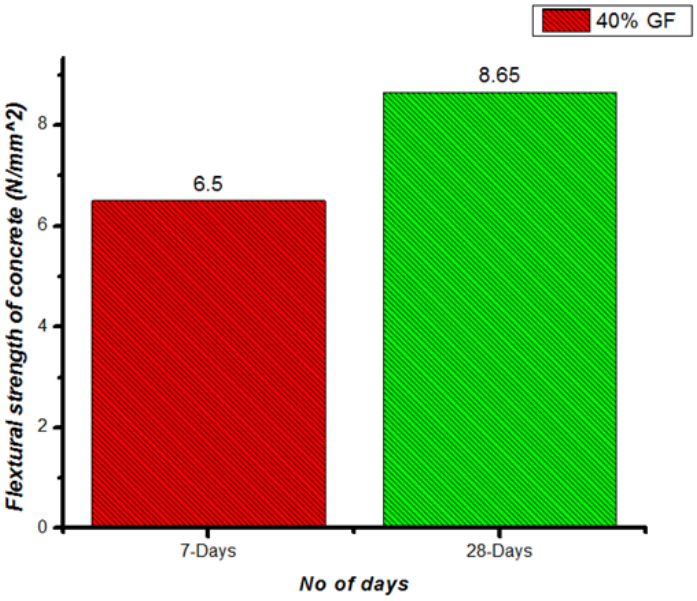


**Figure 2.** Flextural strength of concrete beams on 7-days & 28-days.

**Table 4.** Split tensile strength for M20 grade of concrete mix with different % of glass fiber.

| Grade | No of days | Split tensile strength of (OPC) | 20% GF | 30% GF | 40% GF |
|---|---|---|---|---|---|
| M20 | 7-Days | 3.2N/mm$^2$ | 4.5N/mm$^2$ | 4.75N/mm$^2$ | 4.06N/mm$^2$ |
| | 28-Days | 4.58N/mm^2 | 7.85N/mm$^2$ | 8N/mm$^2$ | 6.85N/mm$^2$ |

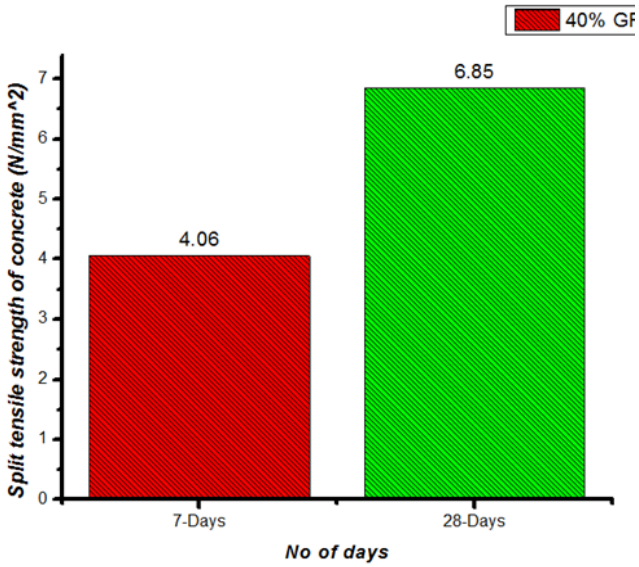


**Figure 3.** Split tensile strength of concrete Cylinder on 7-days and 28-days.

# RESULT

### Compressive Strength of Different Grades of Ordinary Concrete and Varying Percentage Glass Fiber Concrete Mixes

**Table 2** gives 28 days compressive strength for different grades of concrete mixes with different % of glass fiber and their values are observed to be varied from 31 to 38.5 N/mm$^2$ for the M20 grade concretes is **Figure 1** orgin pro chart represent in higher values of 7-days compared to 28-Days of strengths. It most preferable for 7-days, 28-days strength relevant of another or normal mix concretes. **Figure 4** represented compressive strength of cube samples 28- days curing cubes results high strength and load withstanding capacity of cube blocks.

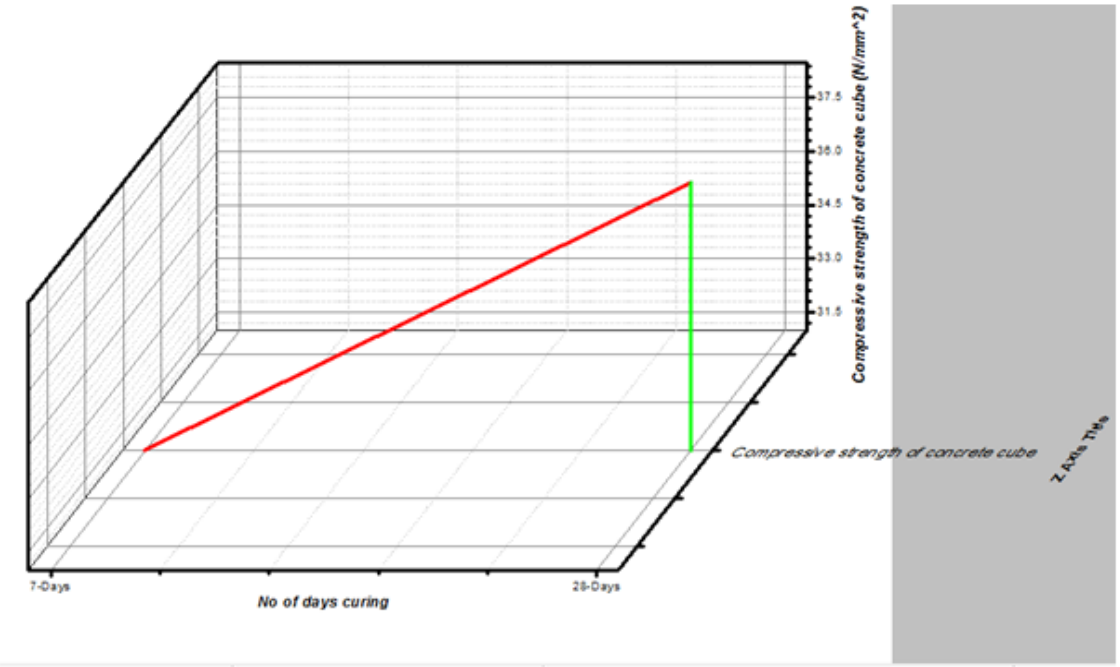


**Figure 4.** Compressive strength of cubes on the 3-D flow diagram.

### Flexural Strength of Ordinary Concrete and Varying Percentage Glass Fiber Concrete Mixes

**Table 3** gives 28 days Flexural strength for different grades of concrete mixes with different % of glass fiber. These values are observed to be varied from 6.5 to 8.65 N/mm$^2$ for M20 grade concrete is **(Figure 2)** orgin pro chart represented in higher values of 7-days compared to normal concrete strength values. It most preferable compressive strength of cubes samples 28-days compared to 7-days. **Figure 5** represented 28-days curing composite concrete beams relevants to high strength and durability effects of beams.

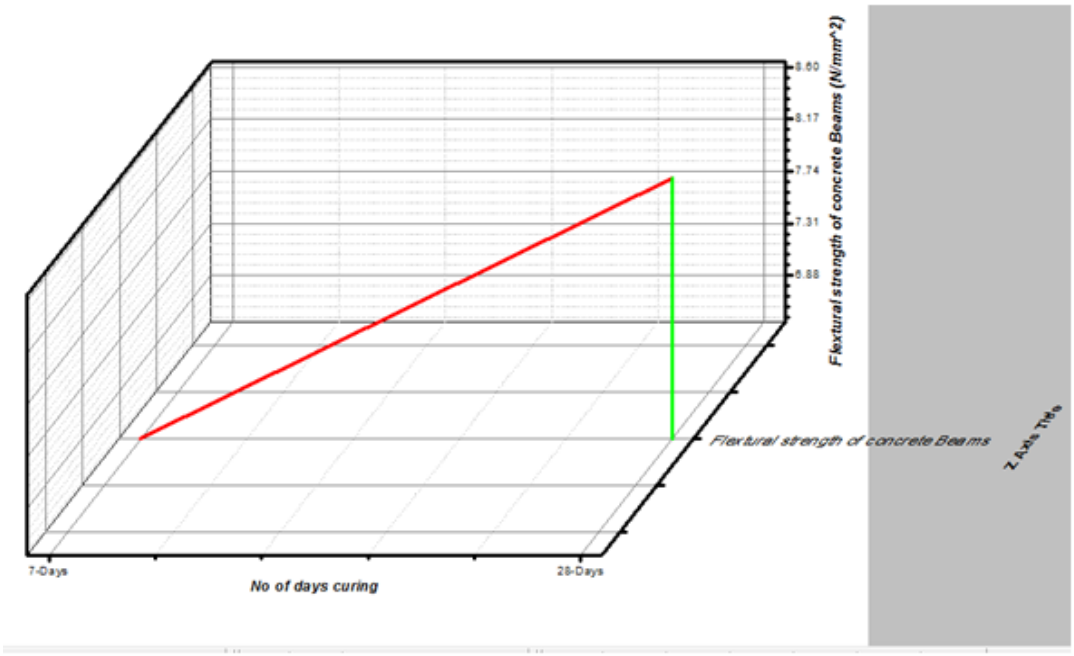


**Figure 5:** Flextural strength of concrete beams on the 3-D flow diagram.

### Split Tensile Strength of Ordinary Concrete and Varying Percentage Glass Fiber Concrete Mixes

**Table 4** gives 28 days Split tensile strength for different grades of concrete mixes with different % of glass fiber and the values are observed to be varied from 4.06 to 6.85 N/mm$^2$ for the M20 grade concrete in **Figure 3** orgin pro chart represented in higher values of 7-days compared to nominal mix concrete strength. It most preferable for 28days curing cubes results. **Figure 6** represent 28-days of curing composite split tensile beams, high impact of lateral load resistant, durability and withstanding capacity of concrete cylinders[11].

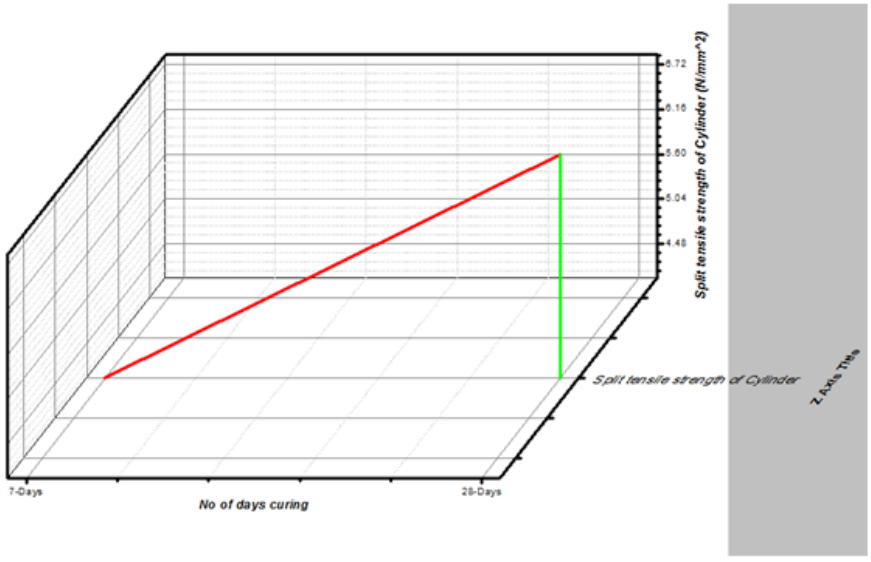


**Figure 6.** Split tensile strength on concrete cylinders on the 3-D flow diagram.

## CONCLUSION

The high operation of fibrous concretes is involved improvements of compressive, tensile strength and dynamic properties like tensile strength, it absorbed the sudden impact energy and absorbing characteristics. Also provides an isotropic strength properties not common in the conventional concrete. Hence it is not likely to replace the conventional structural concrete in total. Higher crack and ductility resistant with distinct post cracking behavior are some of the important static dynamic properties of GFRC. The massive increase in impact resistance and fatigue resistance of the new material to be used in some particular applications.

## REFERENCES


1. Belarbi A, Wang H. Flexural behavior of fiber- reinforced-concrete beams reinforced with FRP re-bars, fiber reinf. polym. Reinf Reinf Concr Struct. 2005;7:895-914.
2. Neal W, Glass fiber reinforced concrete (GFRC), 1978.
3. Hinzen MW. Brameshuber W. Improvement of serviceability and strength of textile reinforced concrete by using short fibres. 4th Colloq Text Reinf Struct. 2009:261–272.
4. Conference WE. Engineering or of steel frames with off-center.2004:1-14.
5. Kim DJ. Strain rate effect on high performance fibre reinforced cementitous composites using slip hardening high strength deformed steel fibres, Michigan. 2008;1-225.
6. Nishant D. Strengthening of reinforced concrete beams using glass fiber reinforced polymer composites master of technology in beams using glass fiber reinforced, Civ Eng. 2009:1-125.
7. Ferreira JPJG, Branco FAB. The use of glass fiber?Reinforced concrete as a structural material. Exp Tech. 2007;3:64–73.
8. Ngala VT, Page CL, Page MM, Corrosion inhibitor systems for remedial treatment of reinforced concrete. Part 1: Calcium nitrite, Corros Sci. 44 (2002;44:2073–2087.
9. Duranovic N, Pilakoutas K, Peter W. Tests on concrete beams reinforced with glass fibre reinforced.1-8.
10. Permeability studies on glass fibre self compacting concrete flexural behaviour of reinforced concrete beams using self compacting concrete.2009.
11. Bureau of Indian Standards. Plain and reinforced concrete, 2000;100.