

# Experimental study on strength of concrete by using Metakaolin & OP

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**Abstract:** Concrete is that pourable mix of cement, water, sand, and gravel that hardens into a super-strong building material. Supplementary cementing materials (SCM) have become an integral part of concrete mix design. These may be naturally occurring materials, industrial wastes or, by products or the ones requiring less energy to manufacture. Some of the commonly used SCM are fly ash; silica fume (SF), GGBS, rice husk ash and metakaolin (MK), etc. metakaolin is obtained by the calcination of kaolinite. it is being used very commonly as pozzolanic material and has exhibited considerable influence in enhancing the mechanical and durability properties of concrete. In this paper, experimental study was carried out on M 20 grade of concrete. In this concrete cement was replaced by metakolin. In various percentages such as 5%, 10%, 15% concrete specimens containing metakaolin were studied for their compressive strength.

**Keyword:** Metakaolin, compressive strength, grade of concrete.

## INTRODUCTION

Concrete is probably the most extensively used construction material in the world. It is an artificial material in which the aggregates are bonded together by the cement when mixed with water. With the advancement of technology and increased field of applications of concrete and mortars, the strength, workability, durability and other characteristics of the ordinary concrete can be made suitable for any situation. For this, definite proportions of cement, water, fine aggregate, coarse aggregate, mineral admixtures and chemical admixtures are required. The demand for Portland cement is increasing dramatically in developing countries. Portland cement production is one of the major reasons for CO<sub>2</sub> emissions into atmosphere. Metakaolin when used as a partial replacement substance for cement in concrete, it reacts with Ca(OH)<sub>2</sub> one of the by-products of hydration reaction of cement and results in additional C-S-H gel which results in increased strength. Metakaolin is obtained by thermal activation of kaolin clay. This activation will cause a substantial loss of

water in its constitution causing a rearrangement of its structure. To obtain an adequate thermal activation, the temperature range should be established between 600 to 750°C. The principal reasons for the use of clay-based pozzolans in mortar and concrete have been due to availability of materials and durability enhancement. In addition, it depends on the calcining temperature and clay type. It is also possible to obtain enhancement in strength, particularly during the strength of curing. The very early strength enhancement is due to a combination of the filler effect and acceleration of cement hydration. IDinakar et al. investigated the effect of using local calcined kaolin or MK obtained commercially as pozzolan on the development of high strength and permeability/durability characteristics of concrete designed for a very low w/b ratio of 0.3. investigated the effect of partial replacement of cement by metakaolin on the properties of concrete. Supplementary cementing materials (SCMs) have been widely used all over the world in concrete due to their economic and environmental benefits. Hence, they have drawn much attention in recent years. Investigated the porosity and pore size distribution of high performance cement paste blended with metakaolin and compared them with silica fume (SF) or fly ash (FA) blended cement pastes. This present study was concerned with the MK-blended cement pastes at lower w/b ratios. The cement pastes prepared were MK blended pastes with MK contents of 5, 10, and 20%, SF-blended pastes with SF contents of 5 and 10%, an FA blended paste with a FA content of 20%, and a control PC paste without any pozzolanic replacement. The w/b ratio for all the pastes was 0.3.

## MATERIAL

1. Cement
2. Sand
3. Aggregate
4. Metakaolin

**RESULT**

Table No 1 mix proportions &amp; compressive strength of Metakaolin &amp; OP concrete M20 grade

Grade of Concrete	S. No	Type of Mix	Cement (kg/m <sup>3</sup> ) (Cement %)	Metakaolin (kg/m <sup>3</sup> ) (Metakaolin %)	Water (l/m <sup>3</sup> )	Fine aggregate (kg/m <sup>3</sup> )	Coarse aggregate (kg/m <sup>3</sup> )	Compressive strength (MPa) 28 days
M20	1	Normal	320 (100)	0.00 (0)	176	613.7	1160	30.69
	2	MK (05)	304 (95)	16.0 (5)	176	613.7	1160	31.76
	3	MK (10)	288 (90)	32.0 (10)	176	613.7	1160	32.86
	4	MK (15)	272 (85)	48.0 (15)	176	613.7	1160	32.09
	5	MK (20)	256 (80)	64.0 (20)	176	613.7	1160	31.14
	6	MK (25)	240 (75)	80.0 (25)	176	613.7	1160	28.9

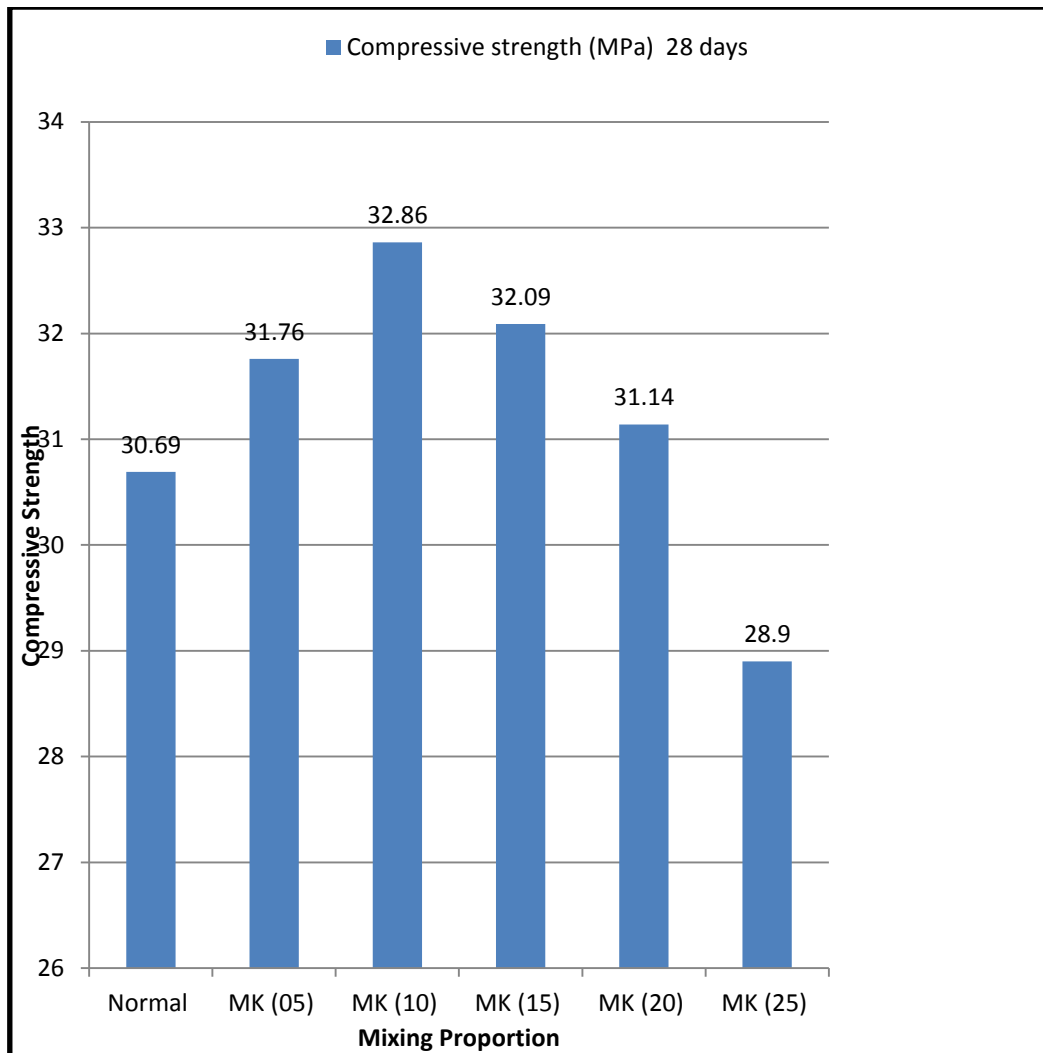


Figure no 1 compressive strength of Metakaolin & OP concrete M20 grade

## CONCLUSION

The compressive strength are better in Hence Metakaolin concrete consisted of 90% OPC and 10% Metakaolin respectively in M 20 grade of concrete.

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