# AN EXPERIMENTAL STUDY ON CONCRETE CONTAINING META KAOLIN WITH HD PET THERMOPLASTIC

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**Abstract -** *Lately, a few examinations and researches were accounted on Meta kaolin independently. The study revealed in the report presents experimental work on the strength parameters of Meta kaolin along with the Hd pet thermoplastic in concrete. The grade of concrete that modified by using this combination is M 40. Here Meta kaolin used as a partial replacement of cement and Hd pet thermo plastic use as a partial replacement of fine aggregate. percentage of Meta kaolin use in present work as 5% and 10% as a cement replacing substance and Hd pet thermoplastic use in the range of 5% to 15% with 5% regular interval as a fine aggregate replacing material. The curing period consider in present study for concrete were 7 days and 28 days for compressive strength.*

*The present study fundamentally focuses around two significant issues and attempts to solve them. First is to save the climate from the destructive gases or toxins coming out from the development of cement from the industries, as cement is highly demanding material in today's world. Because of this fast utilization of normal resources like sand likewise need another option. Here as an option Hd pet thermo plastic as a partial replacement of fine aggregate is used.*

## 1.INTRODUCTION

The main aim of the study is to investigate combined use of Metakaolin and HD-PET Thermoplastics in concrete, initially the reporting on individual effects on both materials on concrete then pick the optimum percentage replacement level for both Metakaolin and HD-PET and then investigate the combined effect of HD-PET and Metakaolin on concrete (combined effect of both the materials are based on the individuals optimum strength for the present work) Grade of concrete for the study has been chosen as M 40.

### 1.1 Materials used in Report

**High Density Polyethylene Terephthalate Thermoplastics**

Plastic have turned into an indispensable piece of our lives. Its low density, strength, lightweight and minimal expense are the elements behind such amazing development. Decrease of waste delivered all throughout the planet is a significant test which society is confronting today.

**Thermoplastic** is a material which turns out to be delicate when warmed and hard when cooled. Thermoplastic can be cooled and warmed a few times, and they can likewise be reused, they additionally freeze to a glazy state when cooled enough. Thermoplastics are the materials which are produced by the reusing of waste plastic as plastic granules of size going from 4-5mm long.

HD PET PLASTIC POWDER FORM

**Table -1:** Properties of Hd Pet thermo plastic

| S. No | Physical Properties | HD Pet thermoplastic |
|---|---|---|
| 1. | Density | 350 – 400 kg/m$^3$ |
| 2. | Young's modulus | 1900 MPa |
| 3. | Colour | Whitish lustrous |

**Metakaolin** isn't a byproduct. it's obtained by asserting unadulterated or refined mineral dirt at a temperature of 6500 to 8500 ° C so grinding to a highly fineness. Metakaolin could be a pozzolanic supplement/item that has a few explicit properties. Metakaolin is realistic in numerous elective assortments and characteristics.

**Table -2:** Properties of Meta kaolin Properties

| S.No | Chemical Properties | Meta kaolin |
|---|---|---|
| 1. | CaO | 0.09% (max) |
| 2. | $SiO_2$ | 52% |
| 3. | $Al_2O_3$ | 46% |
| 4. | $Fe_2O_3$ | 0.60% (max) |
| 5. | $SO_3$ | - |
| 6. | MgO | 0.03% (max) |
| 7. | $TiO_2$ | 0.65% (max) |

**TABLE 3**

**DESCRIPTION OF RAW MATERIALS USED**

| Raw materials | `Description |
|---|---|
| Ordinary Portland Cement | OPC – 43 |
| | Conforming to IS: 8112 – 1989 |
| | Specific gravity = 3.15 |
| Fine aggregate | Natural river sand |
| | Tested as per IS: 2386 – 1983 |
| | Specific gravity = 2.66 |
| | Sieve analysis test results presented in table 3.2 |
| Coarse aggregate | Specific gravity = 2.7 |
| | Sieve analysis test results presented in table 3.3 |

## 2. STUDIES RELATED TO PRESENT WORK

**Sachin Patil, Veeresh and Sagar (2019)** Present study focused on the increase of the investigation explores and evaluates the outcomes of the of concrete with a variety of replacing of Metakaolin and GGBS (0%, 5%, 10% and 15%) for a w/c of 1.75 and 0.275. in discrete extents of glass fibres (0%, 0.5% and 0.75%) just as a steady level of polypropylene fibres of 0.25% to produce a superior cement. The cubes are handled at seven and 28 days, at that point assessed for their compressive strength. Based on this test examination, following are the conclusions –

- The compressive strength of the concrete mix enhances with the enhancing % of glass fibers.
- The extreme compressive strength achieved for 7 days is 48 MPa for 5% of Metakaolin and GGBS trade for an addition of 0.75% fiberglass. The compressive strength is enhancing by 92% for this mix contrasted with the control normal mixture.
- The most extreme compressive strength acquired for 28 days is 55 MPa for the substitution of 5% of Metakaolin and GGBS because of the increment of 0.75% glass fiber. The compressive strength is enhanced by 83.33% for this mix contrasted with the reference mix.

**San Lwin (2020)** this review centers around the utilization of PET (polyethylene terephthalate) plastic waste to supplant coarse totals in concrete to lessen the thickness of cement. Squashed leftover plastic was utilized in the substantial with fractional substitution of 10%, 20%, 30% and 40% by weight of customary coarse total. Five kinds of substantial examples, including one without plastic total, were prepared for assessment. Each substantial example was tried for compressive strength after a fix season of 7, 14 and 28. The accompanying end focuses can be set up dependent on the work under assessment:

- Plastic can be utilized to supplant a portion of the aggregates in a concrete combination. This plastic aggregate can lessen the unit weight of the concrete.
- The Specific gravity of plastic aggregate was not exactly somehow lesser that regular coarse aggregate and in the range of lightweight concrete aggregate category.
- The utilization of waste PET in concrete gives a few benefits like decrease in the utilization of normal aggregate, removal of waste and counteraction of ecological contamination.

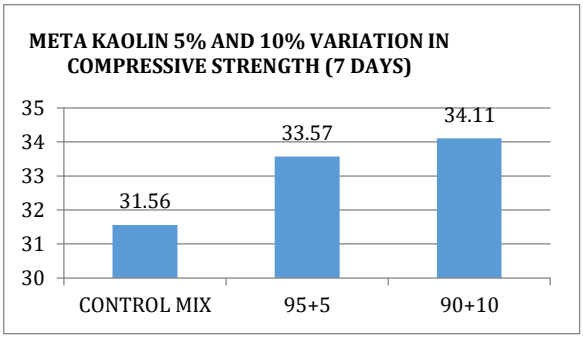
## 3. PROPORTION OF META KAOLIN AND HD-PET THERMOPLASTIC

| S. No | CEMENT + MK(% wise replacement) | CEMENT + MK (Weight wise replacement) |
|---|---|---|
| 1. | 100 + 0 | 363 + 0 |
| 2. | 95 + 5 | 344.85 + 18.15 |
| 3. | 90 + 10 | 326.7 + 36.3 |

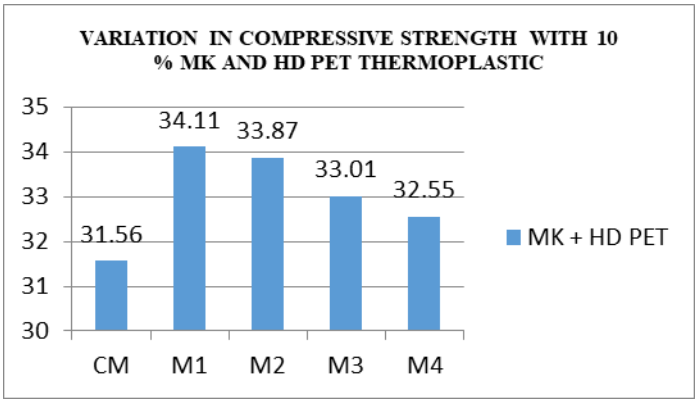
| S. No | F.A + HD-PET (% wise replacement) | F.A + HD-PET (Weight wise replacement) |
|---|---|---|
| 1. | 100 + 0 | 899.75 + 0 |
| 2. | 95 + 5 | 854.77 + 44.98 |
| 3. | 90 + 10 | 809.78 + 89.97 |
| 4. | 85 + 15 | 764.8 + 134.96 |

## 4. RESULTS

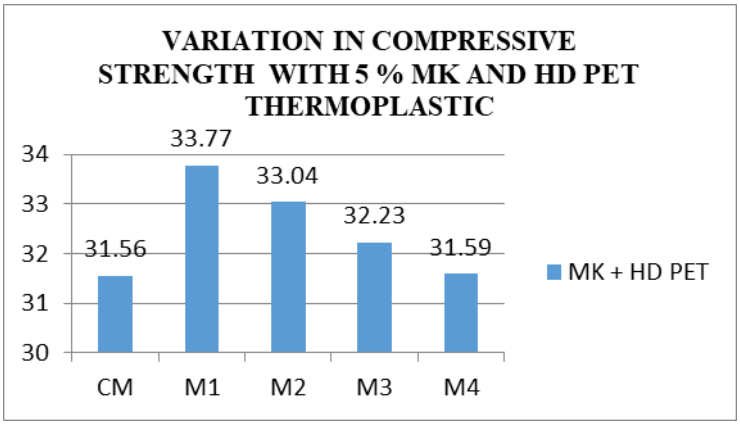
**4.1** The variation in Compressive Strength (At the age of 7 days) with 5% and 10% partial replacement of Meta kaolin in Cement are presented below



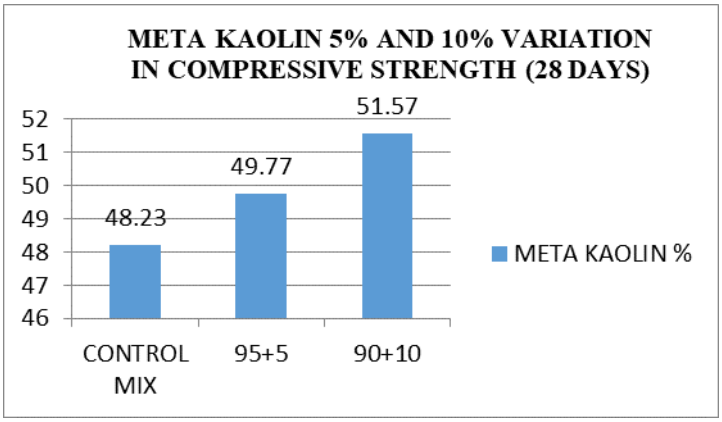

**4.2** The variation in Compressive Strength (At the age of 7 days) of control mix and Meta kaolin as a partial replacement of cement (10%) and along with the partial replacement of fine aggregate by using Hd pet thermoplastic in the range of 5 to 15% with the interval of 5% are presented below



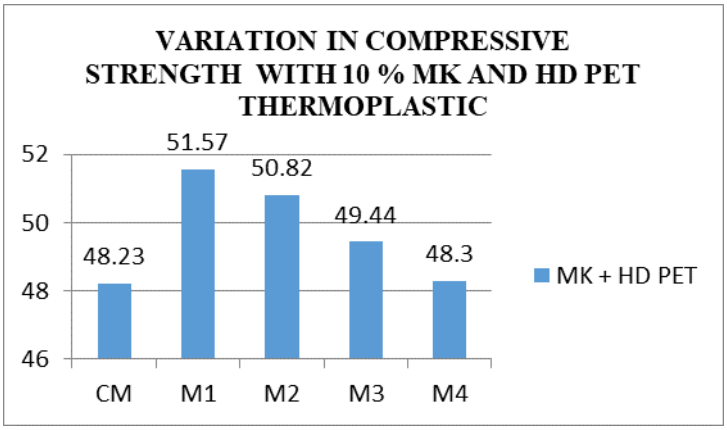

**4.3** The variation in Compressive Strength (At the age of 7 days) of control mix and Meta kaolin as a partial replacement of cement (05%) and along with the partial replacement of fine aggregate by using Hd pet thermoplastic in the range of 5 to 15% with the interval of 5% are presented below



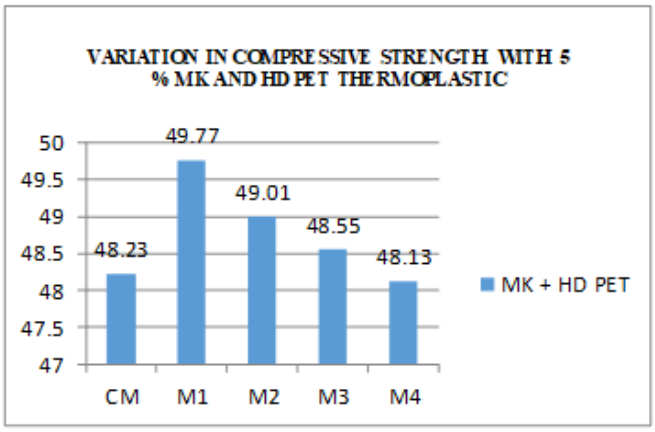

**4.4** The variation in Compressive Strength (At the age of 28 days) with 5% and 10% partial replacement of Meta kaolin in Cement are presented below




**4.5** The variation in Compressive Strength (At the age of 28 days) of control mix and Meta kaolin as a partial replacement of cement (10%) and along with the partial replacement of fine aggregate by using Hd pet thermoplastic in the range of 5 to 15% with the interval of 5% are presented below



**4.6** The variation in Compressive Strength (At the age of 28 days) of control mix and Meta kaolin as a partial replacement of cement (5%) and along with the partial replacement of fine aggregate by using Hd pet thermoplastic in the range of 5 to 15% with the interval of 5% are presented below




## 5. CONCLUSIONS

Compressive strength increases with 5% and 10% content of Meta kaolin in the concrete at the age of 7 and 28 days.

Higher content of Hd pet thermoplastic decreases the strength as well still the combination of 15% hd pet with 5% Mk gives better results as compared to control mix. The strength achieved by the combination is almost equal to the strength of the control mix. Similarly, the combination of 15% hd pet with 10% Mk gives almost equal results as the compressive strength of control mix.

Higher content of Hd pet thermoplastic as a partial replacement of fine aggregate in the mix decreases the compressive strength at the age of 7 and 28 days curing period as compared to the mix prepared with only Meta kaolin but overall strength of mix with Mk and Hd Pet thermoplastic shows the strength around the strength of Control mix.

## REFERENCES

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