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BAKELITE WASTE IN CONCRETE – A Review

Mrs. Sheetal Nalbilwar, Bhavesh Vaswani, Tushar Madnani, Ajay Kukreja

Lecturer, Student, Student, Student

Y. B. Patil Polytechnic, Akurdi, Pune, India

INTRODUCTION:

Safeguarding that every nation's citizen lives in a sustainable and clean environment is one of the most critical challenges facing governments today. The remarkable growth in construction activity has greatly increased the demand for river sand, diminishing and utilizing natural sand resources and having negative environmental backlashes like falling water table and slipping of river edges. So, it is essential to find an alternative material that can be used in place of river sand and crushed sand while making concrete.

Bakelite was invented by Leo Baekeland in 1907 and patented in 1909. It was the first synthetic plastic and marked the beginning of the Polymer Age. Bakelite is formed through condensation reaction of phenol and formaldehyde. In this reaction, phenol and formaldehyde react to produce o-hydroxymethyl phenol, which then reacts with phenol to form Bakelite. It is a thermosetting phenol-formaldehyde resin. Earlier it was used in jewelry (vintage jewelry) and due to its resistance towards heat it is used in kitchen utensils over their handles. Also it is used in electrical appliances such as telephones, adaptors, switches, plugs, insulators and more. Because of its huge demand it leads to the extreme generation of waste, around 80,000 tons of Bakelite waste was generated in India in year 2020. It is a thermosetting plastic that hardens permanently when exposed to heat and pressure. However there are some ways to recycle or reuse Bakelite and our topic is one of them i.e. Bakelite Waste In Concrete. The chemical formula for Bakelite is (C6H6O-CH2OH)n. It has more than 50% carbon present in it so we can't use it for structures near water bodies, as it will result in water pollution. We can use it in blocks, light structure and also in roads. It can also be used in WBM road.

LITERATURE REVIEW:

As per previous studies,

1. An experimental outcome has been made using Bakelite plastic waste particles as fine aggregates in concrete by substitution ranging from 0 % to 15 % with an increment of 2.5 % on the strength benchmarks of standard concrete. The tests are compressive, abrasion, impact energy, water absorption, water permeability, and microstructural properties of concrete with and without Bakelite plastic waste as aggregates were observed, exhibiting good strengths. Strength parameters were examined for optimum concrete and obtained 7.5 % BPW content in fly ash-based concrete mix outstanding strength properties. [1] And in another study
2. It is observed that concrete mixtures made with Bakelite exhibited lower compressive strength than control concrete. Compressive strength of control mix was 32.5 N/mm² on 28 days. From these results, it was observed that the target strength of 25 N/mm2 was achieved at a partial replacement of 10% Bakelite for

coarse aggregate. The compressive strength attained at 10% partial replacement was 25.2 N/mm². Compressive strength of concrete decreased with the increase in Bakelite. However, the target strength was attained up to 10% as partial replacement of coarse aggregate. Reduction in compressive strength with the inclusion of 15% Bakelite could probably due to poor binding process of coarse and fine aggregate in concrete. Moreover if we don't want to compromise strength of the M25 grade concrete, [2] there is an research that states that

3. The utilization of waste Bakelite in concrete with varying percentage like 0%, 17%, 20%, 30%, 40%, 50%, 60% and 70%. Different percentages of Bakelite are added and tests like the slump cone test, compaction factor test were conducted to investigate the fresh properties like workability and compression test were performed to find out the 7, 14 and 28 days compressive strength. It is found that the replacement of fine aggregate with Bakelite can be done up to 20% to achieve compressive strength of 25 N/mm². In research for obtaining compressive strength of M30 grade concrete. [3]
4. The investigation was done and the mechanical properties of concrete were discussed in the present study. The experiment was done with M30 grade concrete for a curing of 7 days, 28 days and 56 days from which its compressive strength, flexural strength, split tensile strength, shear strength and modulus of elasticity were taken and compared with the conventional concrete. The optimum replacement of Bakelite is at 15%. [4]

SCOPE OF WORK:

- Provision of a Sustainable Source of Raw Material.
- Reducing harmful material from the environment.
- Sustainable development with scrap Bakelite waste.
- Development of construction with scrap.
- Advance utilization of scrap in construction.
- Harmless dumping of Bakelite waste.

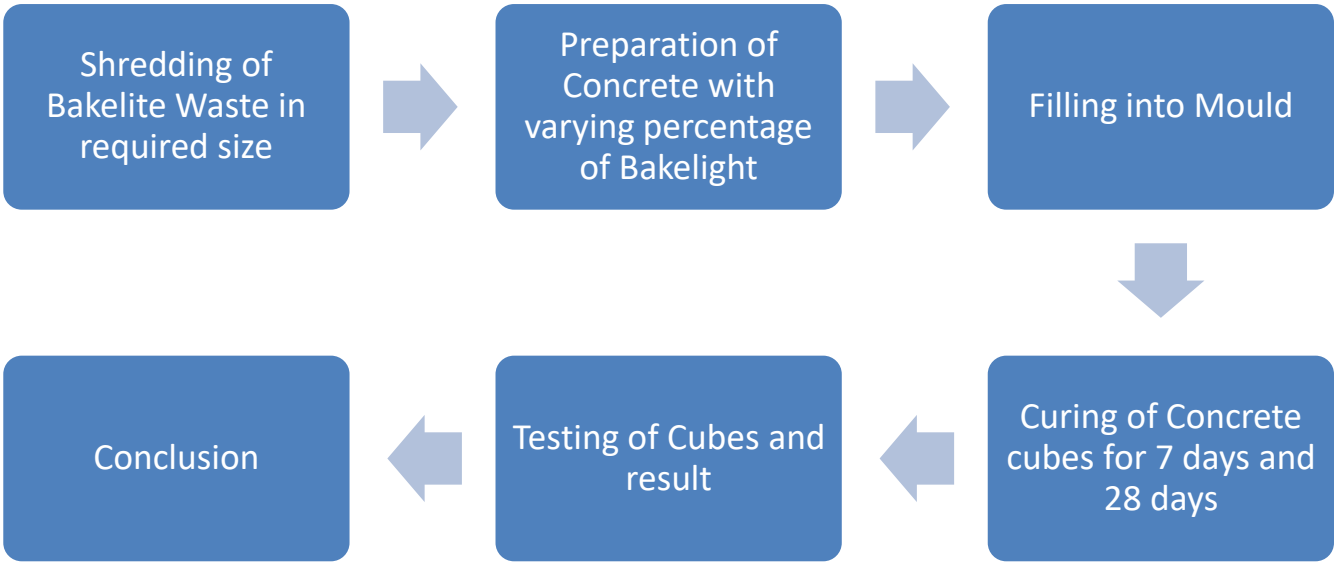
MATERIAL AND METHOD:

Material

1) **Bakelite waste:** Bakelite waste is used Bakelite that has been discarded by the consumer. For example, broken Bakelite jewelry, old telephones, old utensils, e-waste, etc. It is referred to the Bakelite waste which is uncontrolled at dump sites.
2) **Mould:** A cubical mould that is used for compression test is filled with concrete containing Bakelite waste. In our capstone project we are making use of steel moulds.
3) **Cement:** A cement is a binder a chemical substance used in construction that sets, hardens, and adheres to other materials to bind them together. In our capstone project we are making use of 43 grade of (OPC) cement.
4) **Fine Aggregate:** Fine aggregate is essentially any natural sand particles obtained from the land through the mining process. Fine aggregate consists of natural sand or any crushed stone particles that are less than 4.75mm or smaller.

5) **Coarse Aggregate:** Coarse aggregate is a construction material made up of broken rocks which is larger than 4.75mm.
6) **Water:** We will use locally available water for mixing our concrete.

Methodology



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