Magnetized Concrete

Jitendra Kachare[1], Anas Naru[2], Saif Sarekhel[3,] Suraj Singh[4]
[1]*Assistant Professor, Department of Civil, Shree L.r Tiwari College of Engineering*
[2,3,4]*UG Student, Department of Civil, Shree L.r Tiwari college of Engineering*

***Abstract*—: As the world moves towards sustainable development, innovative technologies are increasingly being explored to address the challenges posed by urbanization and transportation. One such promising solution is magnetized concrete roads, which integrate magnetic materials into traditional concrete infrastructure. This abstract presents an overview of magnetized concrete roads, highlighting their potential benefits, applications, and challenges.**

Magnetized concrete roads leverage the principles of electromagnetic induction to enable various smart transportation functionalities. By embedding magnetic materials such as ferrite nanoparticles or magnetic aggregates into the concrete mixture, these roads possess unique properties that facilitate diverse applications. The magnetic field generated within the road structure can interact with vehicles equipped with appropriate sensors, enabling capabilities such as autonomous navigation, vehicle guidance, and energy harvesting.

However, the widespread adoption of magnetized concrete roads faces certain challenges. These include the development of cost-effective manufacturing processes for magnetized concrete, ensuring long-term durability and reliability of the magnetic properties, and addressing potential environmental concerns associated with the use of magnetic materials

Keywords:- Ferrite, Magnetisable, EV Electric.

I. INTRODUCTION

Nowadays, because of the importance of using concrete with high strength and workability in concrete industry, numerous ways have been investigated and suggested by researchers to improve concrete properties. One of the latest achievements is profiting from magnetized in improving concrete properties as well as designing smart concrete elements.

Magnetized concrete road technology is a pioneering approach that integrates magnetic properties into conventional concrete surfaces. This innovation has the potential to revolutionize how we think about roads and their role in transportation. The fundamental principle behind magnetized concrete roads is the embedding of magnetic particles or elements within the concrete mixture during the construction process.

II STATEMENT OF PROBLEM

- There is currently no standardized approach to the composition, manufacturing, and construction of magnetized concrete roads. This lack of standardization hinders widespread adoption and quality control.
- A comprehensive cost-benefit analysis is needed to determine the economic feasibility of using magnetized concrete in road construction. This analysis should consider initial construction costs, maintenance savings, and overall life-cycle costs.

III AIM AND OBJECTIVES

Aim: To develop and implement magnetized concrete road technology as an innovative and sustainable solution for modern infrastructure development, with a focus on improving road performance, safety, and environmental sustainability.

Objective:

1)Improve road safety by creating road surfaces that can dynamically adjust their properties, such as friction, in response to changing weather conditions and traffic situations.

2) Extend the lifespan of road surfaces by using magnetized concrete that is more resistant to wear and tear, reducing the frequency and cost of maintenance and repair

3) Enhance traffic flow and reduce congestion by adjusting the road's properties to optimize vehicle traction, especially in adverse weather conditions.

IV LITERATURE REVIEW

Magnetizable concrete composite materials for wireless power transfer pads installed in roadways:- Piotr Nowotarskia, Michal Pikosa, and Pawel Szymanskia(2017)

The figure of merit for maximizing the power transfer capabilities of WPT pads is the mutual inductance between the aligned primary and secondary coils. With magnetite costing far less than ferrite tiles or bars, MagCon combined with magnetite may prove to be a very economical alternative.

2. MAGNETIZED CONCRETE FOR MOVING ELECTRIC VEHICLES CHARGER:In 2021, Ghanshyam Balotiya and Prakash Somani

Concrete and recycled magnetic particles known as ferrite are combined to create the material, which can then be formed into any shape using standard production methods. The substance can then conduct electricity.

3. Rudolf Hela and Michala Hubertova, "Magnetized Concrete: The Future of Electric Vehicle Charging" (2022)

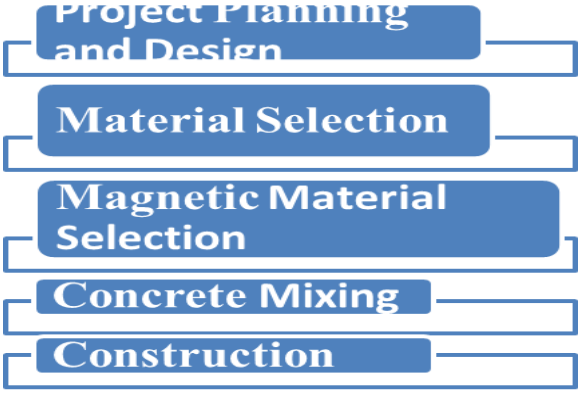
This specific technology uses slabs composed of magnetizable concrete rather than the common concrete. A magnetic field is produced by the high-frequency current flowing through an implanted coil.

4. The cost of electric vehicles can be decreased using magnetized concrete: Kaadelia Dwidarma Nataadmadja & Joshua Adam Picasso Runtuwene (2018)

Our particular technology has the ability to reduce battery size, which will result in an instant cost reduction. This is significant for both private and commercial cars. However, smaller batteries will enable commercial vehicles to carry more freight, which translates to more

V. METHODOLOGY

1. Project Planning and Design:
   - Determine the purpose and scope of the magnetized concrete road, including its length, location, and intended smart features (e.g., wireless charging, traffic monitoring).
   - Develop a detailed road design, considering factors such as traffic load, climate, and local conditions.
2. Material Selection:
   - Select the appropriate concrete mix, including the type and quantity of cement, aggregates, and water, considering the specific requirements of the project.
3. Magnetic Material Selection:
   - Choose the magnetic materials to be added to the concrete mix. Common options include iron powder, magnetite, or ferrite particles. Ensure that the selected materials are suitable for the intended magnetic properties.
4. Concrete Mixing:
   - Mix the concrete ingredients, including the chosen magnetic materials, in accordance with the project specifications. The proportion of magnetic additives will depend on the desired magnetic strength.
5. Construction:
   - Prepare the roadbed, ensuring it's properly graded and compacted.
   - Pour and spread the magnetized concrete mix to create the road surface. It's essential to ensure uniform distribution of magnetic materials throughout the mix.
6. Curing:
   - Allow the concrete to cure and gain strength. Curing time and conditions will vary based on the concrete mix used.
7. Integration of Smart Features:

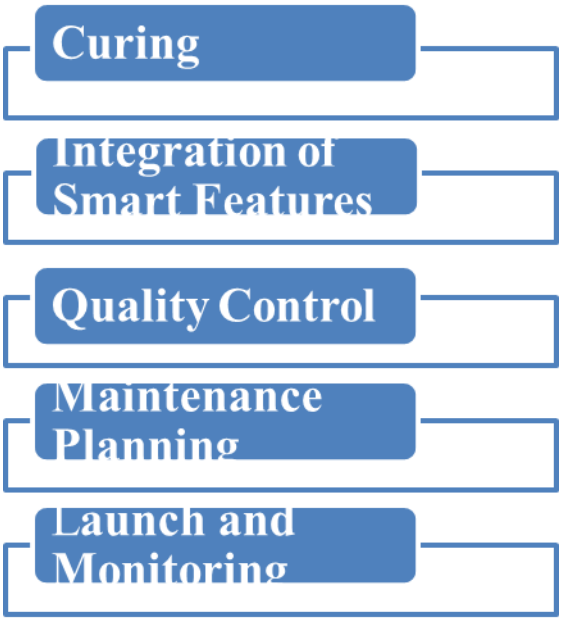


- Install sensors, coils, or electronic components within the road surface, as required for specific smart applications.
- Connect these smart features to a control system or network to enable functionalities like wireless charging, traffic monitoring, and communication with vehicles.

8. Quality Control:

- Conduct quality control tests, such as compressive strength testing, to ensure the concrete meets the necessary standards.
- Verify the magnetic properties of the road, confirming it responds to magnetic fields as expected.

9. Maintenance Planning:



- Develop a maintenance plan for the magnetized concrete road, which may include regular inspections and repairs of smart features.

10. Launch and Monitoring:

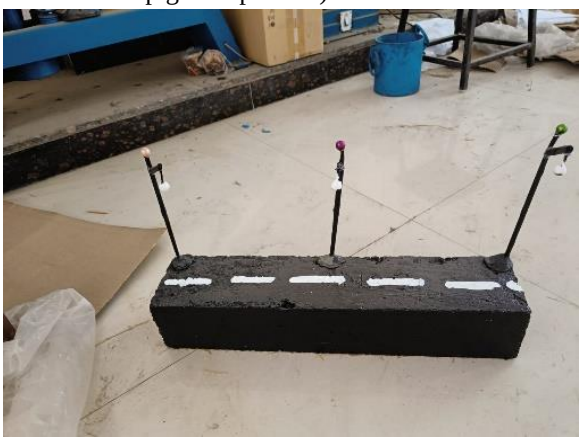
- Open the magnetized concrete road for public use.
- Continuously monitor the road's performance, including its smart features, and make any necessary adjustments or repairs.
- It's important to note that the methodology for creating magnetized concrete roads can vary depending on the specific project and its goals. Also, collaboration with experienced contractors and experts in smart road technology is essential to ensure the successful implementation of such projects. Additionally, local regulations and standards must be followed during every phase of construction to ensure safety and compliance.

VI . Materials Required

1) So, First we designed the mix design according to the M30 grade (1:0.75:1.5) .
2) We collect materails according to mix design and take all of them at one place and add water for mixing materails.
3) Then we took 6 cubes molds (150*150 mm) and greased them Because we had to fill it.
4) Then we prepared concrete and filled 6 cubes with the help of tamping rod.
5) We filled the cube as it was written in this code, in 3 layer and tamping 35 times strokes.
6) Then we took a beam pharma of 150 by 300 mm and applied grease to it.
7) Ans put 10 mm steel in that beam and than fill with concrete for better strength and fill that beam.
8) At last we put Magnetic powder on that beam surface.
9) Then we put 6 cubes and beams in the water.
10) 6 cubes have to be tested for 7, 14, 28 days, and Keep the beam in water for 7 days.
11) And Cube Test will attach in this Report.

VI.MATERIALS USED FOR MODEL MAKING

1. Six Cube mold (150 mm)
2. Concrete Grade M30 (mix ratio- 1/0.75/1.5)
3. Shuttering Oil
4. Tapping Rod
5. Beam Pharma (150*300 mm)
6. Magnetic Powder 150 gm (Black Iron oxide colorant pigment powder)



VII. CONCLUSION

1. Magnetized concrete road is a much better option in the coming future, when all the vehicles will be electric, then the best magnetized strip will be the help for charging, which will be mounted on concrete. And time is secure, when the electric vehicle is over, then there will be no need to stop at any charging station, with the help of magnetic strip which vehicle will charge automatically. This project is lifetime best but costly is quite comparable, so normal road.
2. After the cube test report, which was reported for 7,14,28 days, it was found that the strength of M30 grade is better and correct, according to IS code, the strength of so magnetized concrete road is proper and can provide a mangnetic strip, but it is very costly from normal road and bitumen road.
3. Magnetized concrete roads offer a promising solution for various transportation challenges, but their widespread adoption requires further consideration and research. While initial trials have shown potential benefits such as enhanced road safety, reduced energy consumption, and improved navigation for autonomous vehicles, several factors need thorough examination. These include long-term durability, cost-effectiveness, environmental impact, and the scalability of the technology. Continued innovation and collaboration among engineers, researchers, and policymakers will be crucial in realizing the full potential of magnetized concrete roads and integrating them into our transportation infrastructure effectively.

VIII. REFRENCE

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[6] Magnetised concrete that charges electric vehicles on the move tested in America(driving.co.uk)
[7] Experimenters are testing concrete that could charge your EV while you drive(engadget.com)
[8] Indiana is testing magnetizable concrete for wireless EV charging(thenextweb.com)
[9] bewitched concrete can reduce electric vehicle costs " This specific technology we 're looking at can reduce the size of the battery, and that will incontinently reduce the cost, which is veritably important — both for private and also marketable vehicles. bewitched Concrete the Future of Electric Vehicle Charging?, with Nadia Gkritza(resources.org)

Accoutrements Used for Model Making

1. Six cell earth(150 mm)
2. Concrete Grade M30(blend rate-1/0.75/1.5)
3. Shuttering oil painting
4. Tapping Rod
5. Beam Pharma(150 * 300 mm)
6. glamorous Greasepaint 150 gm(Black Iron oxide color color greasepaint)