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"An Experimental Investigation On Partially Replacement Of Course Aggregate With Waste Rubber And Mno Slag In M20 Grade Concrate."

[1]Saher Sheikh, [2]Shatabdi Rajurkar, [3]Sukeshani Zode, [4]Evangeline Kummari, [5]Prerana Bhagatkar

[1]Student, [2]Student, [3]Student, [4]Student, [5]Assistant Professor

[1]Civil Engineering Department

[1]Rajiv Gandhi Collage Of Engineering Research And Technology, Chandrapur, India

Abstract: this study investigates the partial replacement of coarse aggregate with waste rubber and mno slag in m20 grade concrete. The objective is to assess the impact of these alternative materials on the mechanical properties of concrete, including compressive strength, workability, and durability. Experimental tests were conducted on various mix proportions to evaluate the feasibility of using waste rubber and mno slag as sustainable substitutes. The results indicate that incorporating these materials can enhance certain properties of concrete while contributing to environmental sustainability by reducing waste disposal issues. This research provides insights into the potential applications of modified concrete in construction industries.

Keywords: Recycled waste materials, Analysis, Investigation, Research.

I. Introduction:

This study investigates the partial replacement of coarse aggregate with waste rubber and mno slag in m20 grade concrete. Waste rubber, primarily sourced from discarded tires, poses significant disposal challenges, while mno slag is a byproduct of metal processing industries. Utilizing these materials in concrete not only reduces environmental impact but also enhances certain mechanical properties.

II. Literature review:

1. Waste rubber in concrete

Several studies have investigated the incorporation of rubber aggregates. In concrete to reduce environmental impact and improve flexibility. Research suggests that rubberized concrete exhibits enhanced impact resistance and ductility, but may experience a reduction in compressive strength compared to conventional concrete. Treatment methods such as naoh immersion have been explored to improve bonding between rubber particles and cement matrix.

2. Mno slag as aggregate replacement

Mno slag, a byproduct of metal processing, has been studied for its potential use in concrete. Research indicates that mno slag can contribute to higher compressive strength and durability, making it a viable alternative to natural aggregates. Additionally, its pozzolanic properties may enhance the long- term performance of concrete structures.

3. Combined effects of waste rubber and mno slag

Studies combining rubber aggregates and mno slag suggest that an optimized mix can balance strength and flexibility, making it suitable for specific applications such as road pavements and lightweight structures. However, further research is needed to determine the ideal proportions for maximizing benefits while maintaining structural integrity.

III. Materials:

Duration of curing	No. of cubes	Material	Mix Proportion			
			0%	3%	6%	9%
7	9	Cement	3.135	3.135	3.135	3.135
		Course Aggregate	8.7925	7.6525	6.5075	5.365
		Fine Aggregate	5.5825	5.5825	5.5825	5.5825
		Water	1.4	1.425	1.425	1.425
		Rubber Tire	0	0.35	0.703	1.053
		MnO Slag	0	1.17	2.343	3.516
14	9	Cement	3.135	3.135	3.135	3.135
		Course Aggregate	8.7925	7.6525	6.5075	5.365
		Fine Aggregate	5.5825	5.5825	5.5825	5.5825
		Water	1.4	1.425	1.425	1.425
		Rubber Tire	0	0.35	0.703	1.053
		MnO Slag	0	1.17	2.343	3.516
28	9	Cement	3.135	3.135	3.135	3.135
		Course Aggregate	8.7925	7.6525	6.5075	5.365
		Fine Aggregate	5.5825	5.5825	5.5825	5.5825
		Water	1.4	1.425	1.425	1.425
		Rubber Tire	0	0.35	0.703	1.053
		MnO Slag	0	1.17	2.343	3.516

Sr No.	Material	Quantity
1.	Cement	50.16 kg
2.	Course Aggregate	113.27 kg
3.	Fine Aggregate	89.32 kg
4.	Water	22.8 litter
5.	Rubber Tire	6.32 kg
6.	MnO Slag	21.09 kg

IV. Material Testing:

The Most Common Of All The Tests On Hardened Concrete Is The Laboratory Test Of Concrete In Construction Should Be Prepared To Calculate. Here The Mix Ratio Of m20 Grade And W/C Ratio Of 0.45. The Size Of The Cube Is (150 X 150 X 150) mm

Fig (1): Concrete Mixing

Fig(2): Casting

Fig(3): Curing

Fig(4): Demolding

V. Result:

Fig(5): Compression Testing Machine

Fig(6): Load At The Cracking

0%	Cube 1	Cube 2	Cube 3
7 Days (N/mm^2)	16.22	19.11	17.82
14 Days (N/mm^2)	21.33	16	17.78
28 Days (N/mm^2)	22.26	29.02	24.80

Result for 0% waste rubber tyre and 0% slag

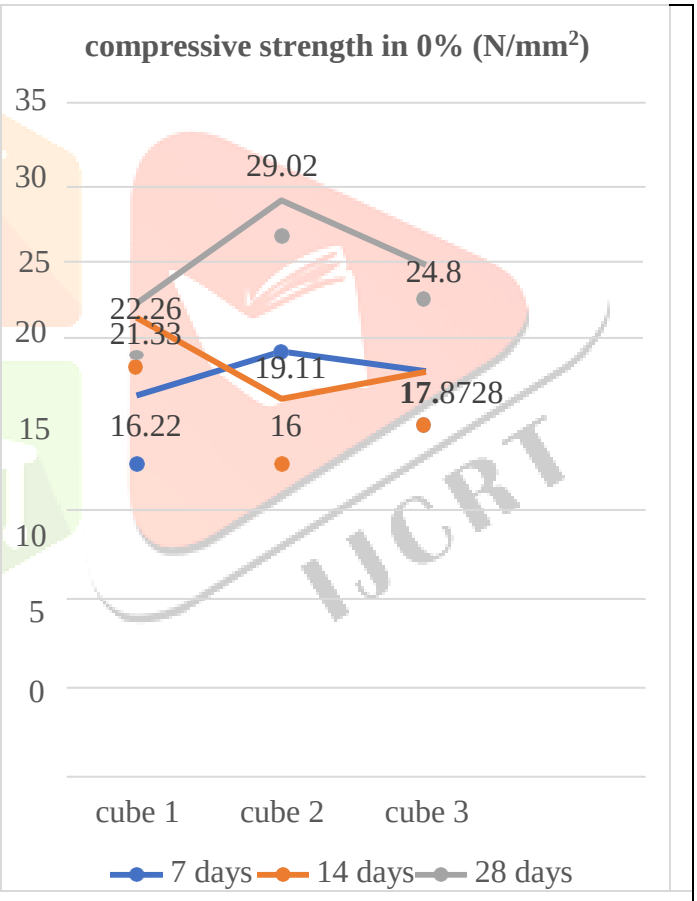
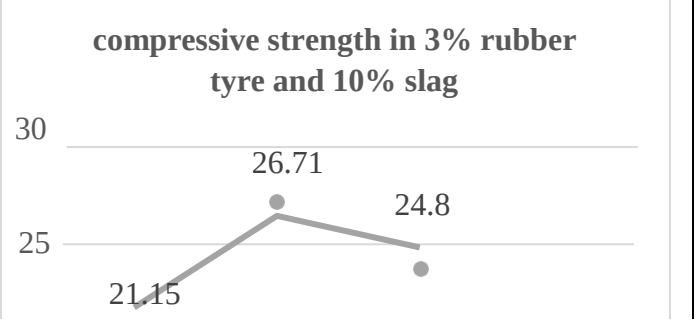


Chart for 0% waste rubber tyre and 0% slag

3%	Cube 1	Cube 2	Cube 3
7 Days (N/mm^2)	15.60	15.37	18



14 Days (N/mm^2)	15.24	18.22	18.04
28 Days (N/mm^2)	21.15	26.71	24.80

Result for 3% waste rubber tyre and 10% slag

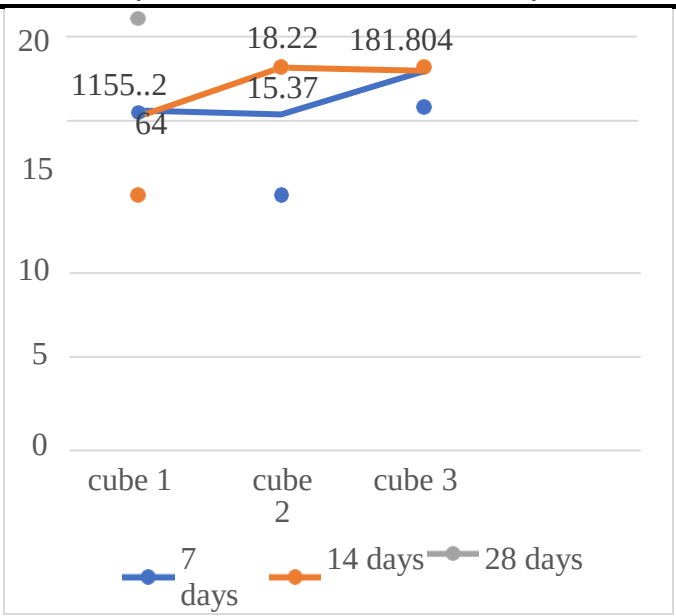


Chart for 3% waste rubber tyre and 10% slag

6%	Cube 1	Cube 2	Cube 3
7 Days (N/mm^2)	14.26	13.60	14.66
14 Days (N/mm^2)	15.15	13.55	16.97
28 Days (N/mm^2)	18.66	23.64	22.80

Result for 6% waste rubber tyre and 20% slag

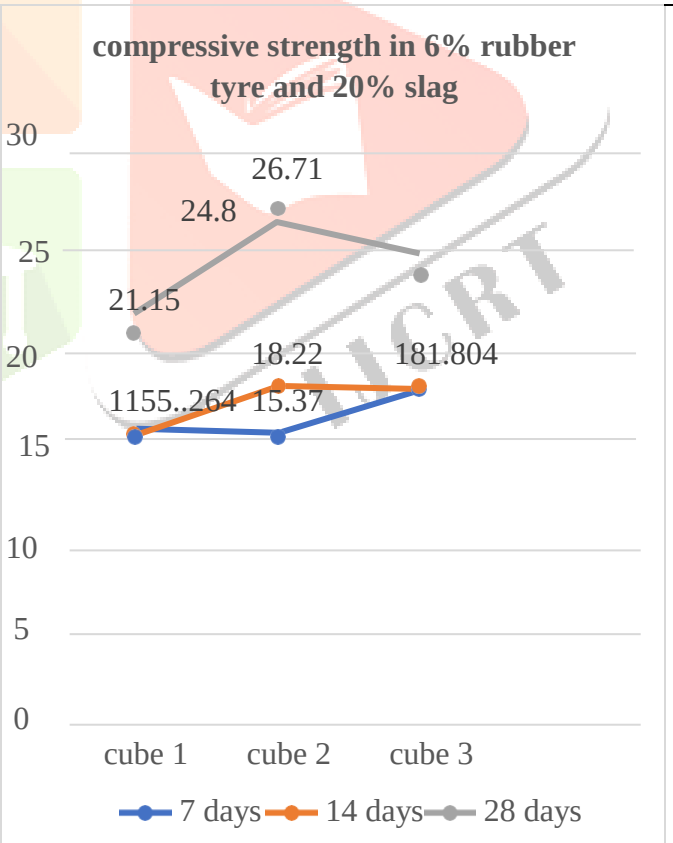
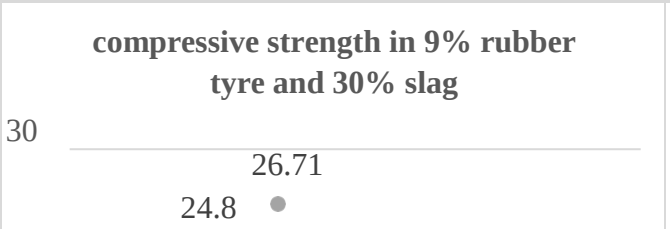


Chart for 6% waste rubber tyre and 20% slag

9%	Cube 1	Cube 2	Cube 3



7 Days (N/mm^2)	12.44	11.64	8.93
14 Days (N/mm^2)	9.37	12.17	11.28
28 Days (N/mm^2)	15.86	13.20	12.44

Result for 9% waste rubber tyre and 30% slag

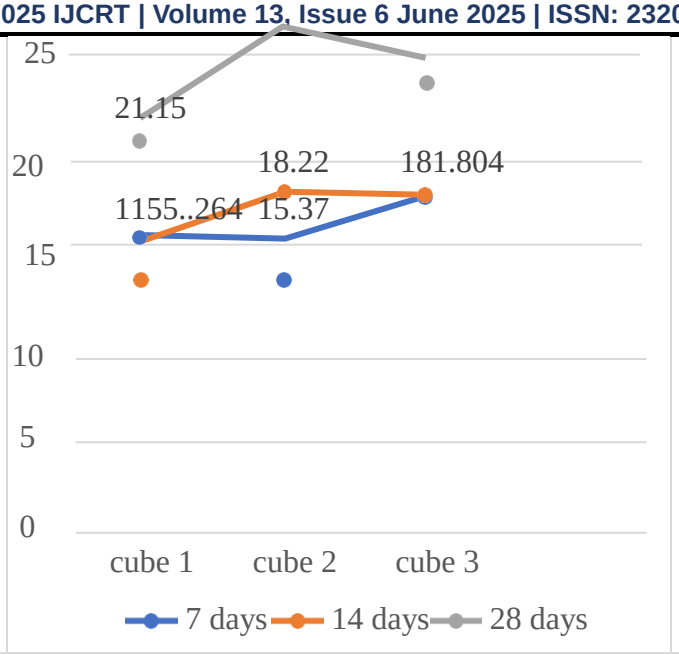


Chart for 9% waste rubber tyre and 30% slag

VI. Comparison Result For All Cubes:

CUBES	0% (N/mm^2)	3% (N/mm^2)	6% (N/mm^2)	9% (N/mm^2)
7 DAYS	17.71	16.32	14.17	9.06
14 DAYS	18.37	17.16	15.22	10.94
28 DAYS	25.36	24.22	21.70	13.83

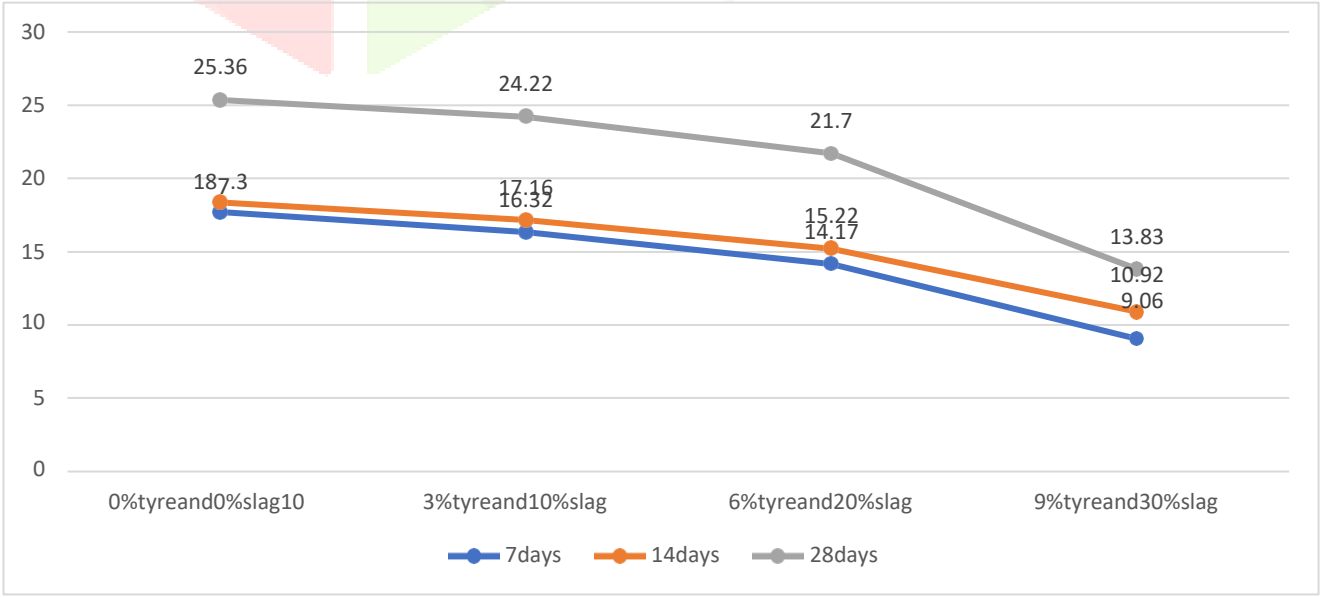
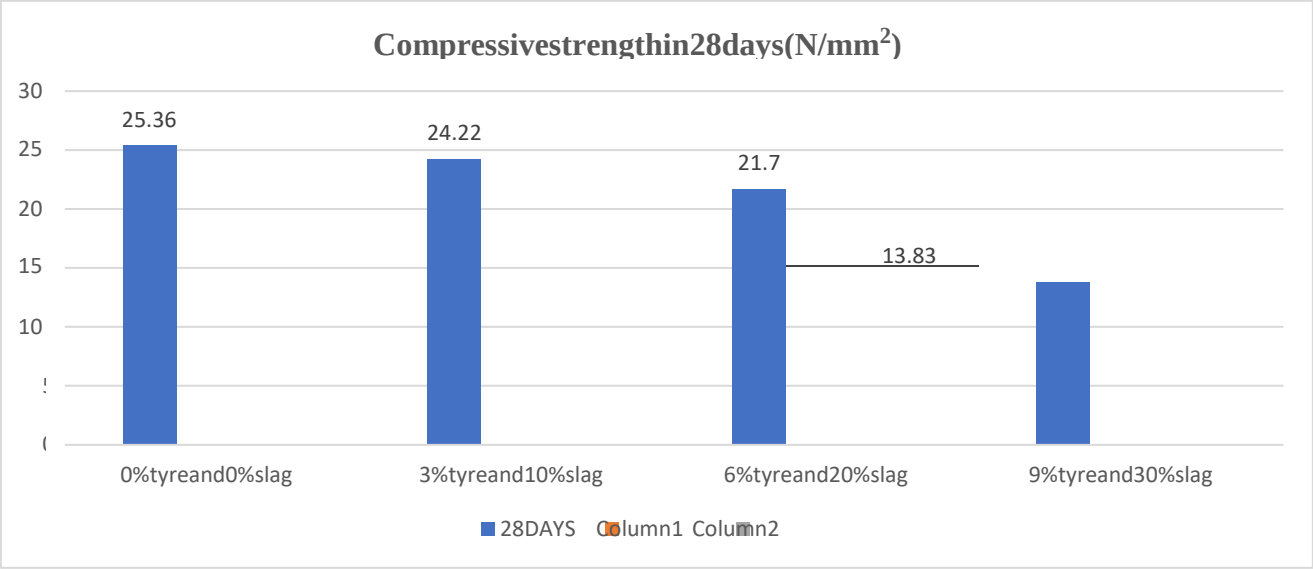


Chart For All Cubes



Average Compressive Strength For 28 Days

VII. Conclusion:

This study investigated the effects of partial replacement of coarse aggregate with rubber tyre (3%, 6%, and 9%) and mno slag (10%, 20%, and 30%) on the compressive strength of concrete. The results indicate that incorporating these materials leads to a slight decrease in compressive strength, ranging from 1-2 N/mm², compared to conventional concrete.
Despite this reduction, the modified concrete mixtures may still be suitable for specific applications where lower strength is acceptable. Further research is recommended to explore the potential benefits of using rubber tyre and mno slag in concrete, such as improved durability, sustainability, or cost-effectiveness.

1. Compressive Strength Of Conventional Cube At 7 Days Is 17.71 N/mm², At 14 Days Is 18.37 N/mm² And At 28 Days Is 25.36 N/mm².

2. Compressive Strength Of Concrete Cube By Partially Replacing Coarse Aggregate With Rubber Tyre (3%) And Mno Slag (10%) At 7 Days Is 16.32 N/mm², At 14 Days Is 17.16 N/mm² And At 28 Days Is 24.22 N/mm².

3. Compressive Strength Of Concrete Cube By Partially Replacing Coarse Aggregate With Rubber Tyre (6%) And Mno Slag (20%) At 7 Days is14.17 N/mm², At 14 Days 15.22 N/mm² And At 28 Days Is 21.70 N/mm².

4. Compressive Strength Of Concrete Cube By Partially Replacing Coarse Aggregate With Rubber Tyre (9%) And Mno Slag (30%) At 7 Days Is 9.06 N/mm², At 14 Days Is 10.94 N/mm² And At 28 Days Is 13.83 N/mm^2.

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