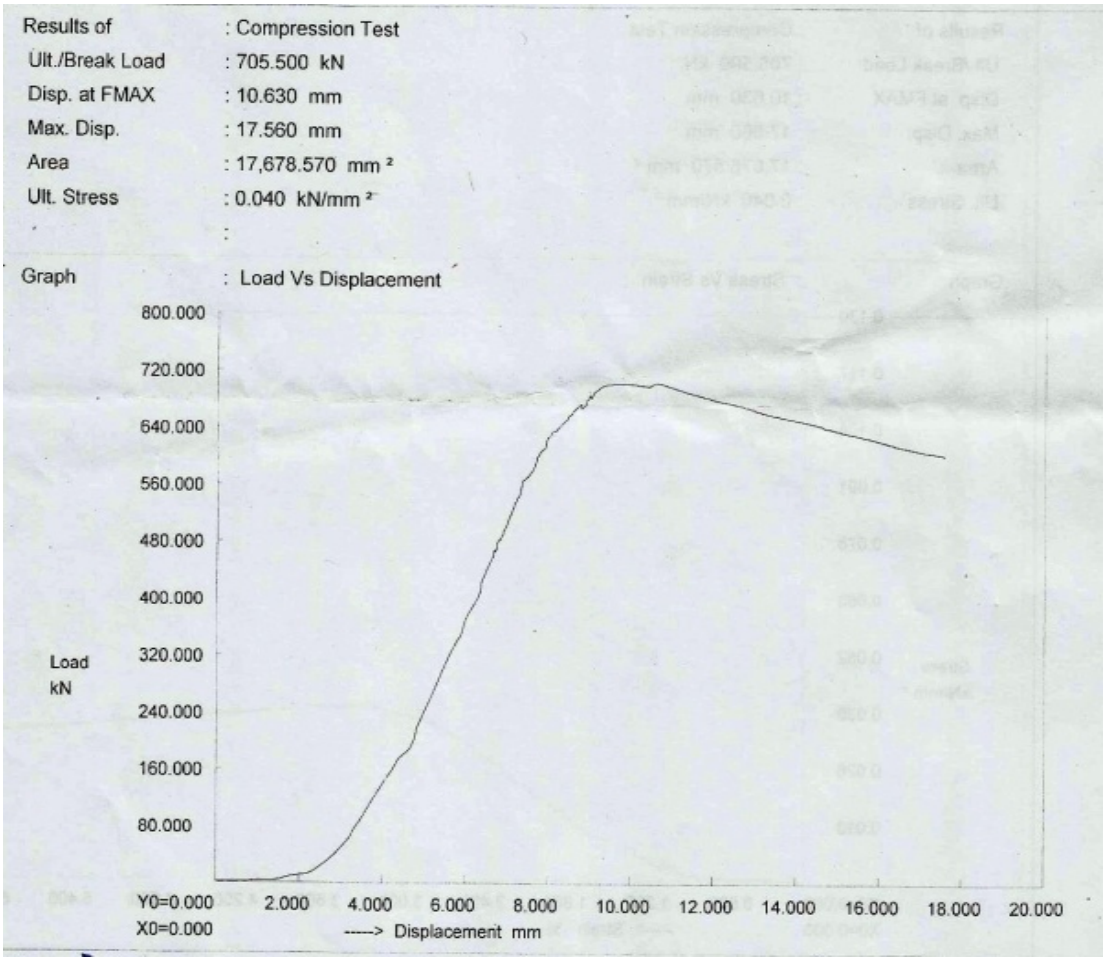

Figure 3: Stress-strain graph obtained

4.5 Wrapping on cylinders

- Specimen is dried for the surface to be free of any moisture
- Resin and hardener are mixed in proportion of 100: 35 by weight and mixed continuously for 5 minutes to have uniform color.
- Surface is made smooth by rubbing with sand paper and loose particles were removed using brush.
- One coat of epoxy was applied on the surface of cylinder.
- Cylinder was wrapped with glass fiber sheet having an overlap of 75mm to avoid failure in overlap region.
- One more layer of epoxy was applied and specimen was cured for 7 days.

4.6 Extensive testing methodology

- Control specimens were tested up to failure.
- Specimens were loaded up to first crack.
- Cracks were repaired with cement mortar and cured for seven days.
- Specimens were wrapped with one and two layer of GFRP.
- Specimen were loaded up to failure
- Repaired specimens were cured for seven days.
- Specimens were wrapped with one and two layer of GFRP.

Note: The same procedure was followed to test the cylinders wrapped with GFRP sheets

Figure 4: Woven GFRP sheet installed on cylinder specimen

4.7 Mix content and its proportion

- Cement 75g per cylinder
- Metakaloin 10% of cement
- Super plasticizers=Gelenium b233 (3%of cement)

- Viscous modifying agent=Gelenium stream II (0.04% of cement)

5. Results and Discussions

The stress-strain graphs obtained for a cylinder with single wrap of GFRP sheet using epoxy and then with MBC binder is given below.

Cylinder with single wrap: 1st-Crack with single Wrap, Full Failure cylinder with single Wrapping using EPOXY

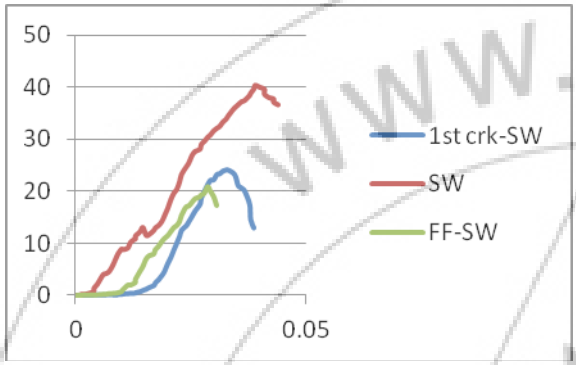

Figure 5: Epoxy resin binder - single wrapped cylinder

Cylinder with single wrap: 1st-Crack with single Wrap, Full Failure cylinder with single Wrapping using MINERAL BASED COMPOSITES

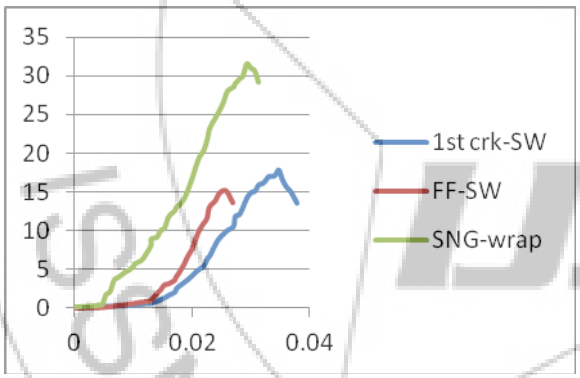

Figure 6: MBC binder - single wrapped cylinder
SCALE: On x-axis 2cm = 0.01 strain.
On y-axis 2cm = 5 N/ mm2 stress

6. Tabulation

The results obtained for increase in strength for test specimen along with cracked and wrapped specimen are tabulated.

Table 3: Results obtained using epoxy binder

S. No	*Specimen description*	*Maximum load carried (KN)*	*Compressive strength (N/mm^2)*	*Percentage increase in strength (%)*
1	Control specimen	431.479	24.407	-
2	Control specimen single wrapping	712.373	40.296	65.10
3	Control specimen double wrapping	1148.50	64.966	166.17
4	First cracked specimen	340.187	19.243	-
5	First cracked specimen single wrapping	495.311	28.850	48.84
6	First cracked specimen double wrapping	518.852	32.913	71.03
7	Full failure specimen	431.479	24.407	-
8	Full failure specimen single wrapping	454.055	26.447	8.35
9	Full failure specimen double wrapping	505.393	28.588	15.31

Table 4: Results obtained using MBC binder

s.no	*Specimen description*	*Maximum load carried (KN)*	*Compressive strength (N/mm^2)*	*Percentage increase in strength (%)*
1	Control specimen	421.952	23.868	-
2	Control specimen single wrapping	646.911	36.593	53.31
3	Control specimen double wrapping	963.535	54.503	128.35
4	First cracked specimen	324.472	18.354	-
5	First cracked specimen single wrapping	504.546	28.54	55.5
6	First cracked specimen double wrapping	554.842	31.385	71
7	Full failure specimen	421.952	23.868	-
8	Full failure specimen single wrapping	476.349	26.945	12.89
9	Full failure specimen double wrapping	531.347	30.056	25.92

7. Comparison of Results (Epoxy Vs MBC)

The results obtained for a cracked, wrapped cylindrical specimen for epoxy resin and MBC binder is compared and contrasted in the table provided below for our reference.

Table 5: Results comparison for epoxy Vs MBC binder

S. No	*Specimen description*	*Percentage increase in strength using EPOXY binder(%)*	*Percentage increase in strength using MBC binder (%)*
1	Control specimen single wrapping	65.10	53.31
2	Control specimen double wrapping	166.17	128.35
3	First crack specimen single wrapping	48.84	55.5
4	First crack specimen double wrapping	71.03	71
5	Full failure specimen single wrapping	8.35	12.89
6	Full failure specimen single wrapping	15.31	25.95

8. Conclusion

Having the concept of sustainability in mind along with labor safety, the use of mineral based composites will reduce the dangerous impacts .The results above indicate that even though epoxy binder increases the strength, it causes dangerous impacts on labor health due to long exposure to it. Moreover it is costly when compared with MBC. The above tabulated result shows the comparison between epoxy binder and MBC binder. It shows that the strength obtained between the two do not differ much. Epoxy in comparison with MBC gives higher increase in strength but it also accompanied by demerits like High cost, highly dangerous to work with, requires special condition for its usage. These are overcome by using mineral Based composites which can be made by using normally used materials. Thus we conclude that the uses of mineral based composites have also shown good results and it is comparatively inexpensive as compared to epoxy and the materials are also easily available. Thus this new method is the sustainable development to protect the environment from pollution by using epoxy resins.

Figure 5: Cylinder wrapped with MBC binder and fully cracked specimen

9. Future Scope of this Project

Research on this topic helps us to obtain an innovative method of FRP sheets bonding using MBCs which acts as a replacement for conventionally used epoxy binders. Further, the strength achieved using MBCs can be increased by various other admixtures, superplasticizers, etc. as it will overcome the demerits of epoxy by reducing the carbon footprint and providing a safe and sustainable atmosphere for human habitation in the near future.

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Author Profile

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