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BEHAVIOUR OF FLY ASH USED AS A LANDFILL STABALISED WITH LIME AND RECRON 3s FIBRE

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Abstract-*In this study we are analyzing the behavior of fly ash when stabilized by lime and fibre. In this study we have analysed the variation of shear strength of fly ash(class F) when stabalized with lime and recron 3s fibre(6mm,12mm).Test are performed individually on every material as well as their combination, so as to check for the optimum amount of material used for maximum strength and also to be cost efficiently. Specific gravity and sieve size analysis also done on the fly ash based on the I.S code. Vane Shear test is performed in this study for finding the shear strength and torsional force applied on the sample. In this study we also find out the index properties of the fly ash. Finally from the result fly ash can be used in land fills and as borrow soil*.

KEYWORDS : Recron 3s fibre , Fly ash, Lime , Shear Strength .

INTRODUCTION-

Flyash ,which is a coal combustion by-product, has the potential to become one of the major disposal problem or one of the major alternate construction material solution of the next decade.Mostly fly ash is an by product of an coal combustion factories and Flyash is used as a replacenment of a soil .

About 8% of the produced flyash is being used commercially industries. This shows that there exists a tremendous potential of utilization of flyash in geotechnical construction. Flyash is not effect the top layer of soil .

Geotechnical constructions like embankment retaining structure etc require huge amount of earth materials. Rapid industrialization and non-available of conventional earth material have forced the engineer and the scientist to utilize the waste product of industries which either degrade the environmental pose problems for their disposal.Structures are to be protected from getting wet in order to preserve the inherit strength of the compacted flyash, which is difficult task in field situation.

The use of reinforcement in improving the strength parameters of geomaterials has taken momentum due to the availability of variety of synthetic materials commercially at cheaper rates. The basic principles involved in earth reinforcement techniquesare simple and have been used by mankind for centuries.

Soil is the basic foundation for any Civil Engineering structure. It is required to bear the loads without failure. In some places soil maybe weak which can't resists the incoming loads for which soil stabilization is needed. Numerous methods are available in literature for soil stabilization. But sometimes some of the methods like chemical stabilization adverse effect the chemical composition of the soil.

Fly Ash Composition	Percentage
Silica (SiO2)	55.9%
Alumina (Al_2O_3)	27.7%
Ironoxide (Fe_2O_3)	5.3%
Calcium Oxide (CaO)	3.2%
Un- burnt Carbon	4.1%
Un-burnt oxide	2.7%

One of the essential characteristics of reinforced soil is that it is made with two types of elements, soil grains and reinforcements. The basic mechanism of reinforced earth involves the generation of frictional forces between the soil and reinforcement. By means of friction the soil transfers the forces developed in earth mass to the reinforcement thus developing tension. The earth develops pseudo cohesion in the direction in which reinforcement is placed and the cohesion is proportional to tension developed in reinforcement.

Soilmass is generally a discrete system consisting of soil grains and is unable to withstand tensile stresses. The use of reinforcement in improving the strength parameters of geo materials has taken momentum due to the availability of variety of synthetic materials commercially at cheaper rates. The basic principles involved in earth reinforcement techniques are simple and have been used by mankind for centuries.

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Soilmass is generally a discrete system consisting of soil grains and is unable to withstand tensile stresses and this particularly true in the case of cohesion less soil like sand. Such soil cannot be stable on steep slopes and relatively larger strain will be caused when external lands are imposed on them.

Why lime is used

Lime is one of the most widely used and successful soil stabalizers. Lime reacts with the siliceous matter of the soil to form a bond. Best result are obtained when lime is worked with well graded soil having less than 50% of its particle finer than 75 microns and plasticity index as less than 20%.Lime reduces the plasticity index of highly plastic soil making them more easy to be handled and pulverized.

PROPERTIES OF RECRON 3S FIBRE

Table – 1

S.No	Property	Specification
1	Cross-section	Triangular
2	Diameter	35-40 micron
3	Color	White
4	Cut Length	6mm, 12mm, 24mm
5	Dispersion	Excellent
6	Acid resistance	Excellent
7	Alkali resistance	Good
8	Specific gravity	1.36
9	Melting point	240-260^0 Celsius
10	Flash point	>329^{0}C
11	Relative Density	0.89-0.94 g/cm^3
12	Elongation	45-55%
13	Young's Modulus	17.5x10^3 Mpa
14	Tensile Strength	4000-6000 Kg/cm^2
15	Moisture	<1%

LITERATURE REVIEW-

ARTHANOOR (1976) reports that two sub-grade layers of each 100 mm thickness were laid one over the other with 75% sand, 22.5% flyash and 2.5% lime with water flyash ratio as 0.9. After completion of water curing and drying of surface the convention bituminous weaving coat of 25 mm thick was laid. The cost is less by 30% as compared to conventional subgrades.

ARTHANOOR reports that flyash increases the yield of paddy and ragi by 0 to 25% by conditioning of soil. Flyash conditioning appears more suitable for acidic soils and it improves the consistency of clayey soils and supplies some micronutrients to the soil

GREENWELL better than the crushed stone or graded gravel. Flyash with sustainable amount of lime forms a hard and impermeable mass, which provides a very good base and sub-base couse for highway pavements.

SIVAGURU (1984) :- bituminous binder and surface coarse when laid over lime flyash aggregate. Base coarse waved function better compared to water bound macadam (wbm).

ARVIND KUMAR 2007 :- the optimum value of lime for fly ash lime and soil mixture is taken between 8 to 15%.The ratio of split tensile strength and unconfined compressive strength increases with increase in fibre content.

PARVEEN KUMAR 2008 :- unconfined compressive strength value of fly ash and mixes for given fibre content, increaseslinearly with increase in fibre content thereafter the gain in strength\th is smaller this is due to the fact that the balling-ip of fibre take place and there after and fibre may not remain straight

TEST-

Vane shear test

This test gives us undrained strength of the soil, in undisturbed as well as remoulded conditions both. Vane shear test is a cheaper and quicker method of measuring the shear strength of soil, as compared to very elaborate tri-axial shear test or direct shear test.

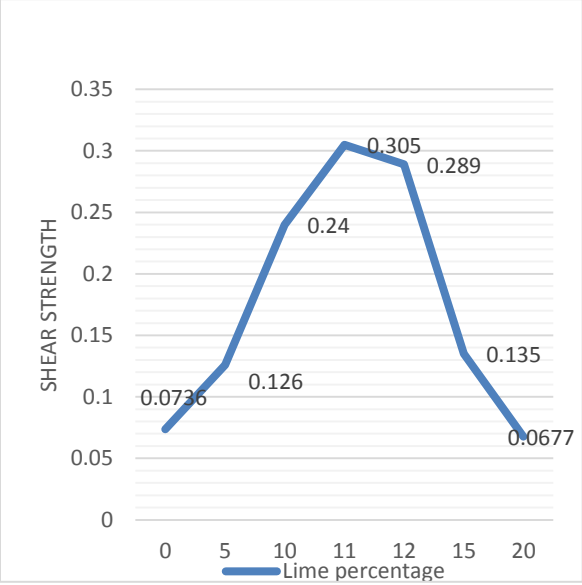
DISCUSSION-

Flyash reinforced with Recron fibre and lime can be considered to be good grained improvement technique especially in engineering projects on weak soil where it can act as a substitute to deep/raft foundation, reducing the cost as well as energy.

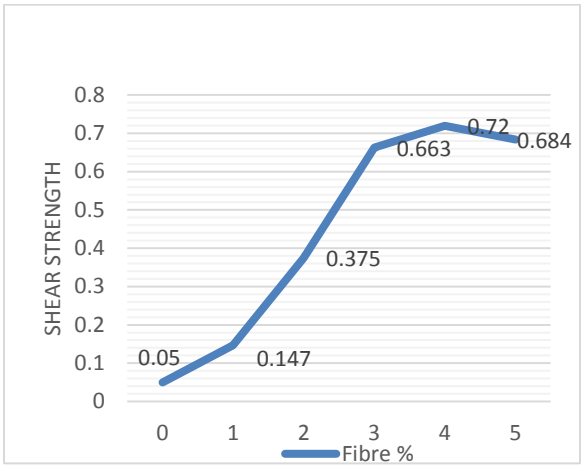
Flyash and Recronfibre is also available and cheap material. If fly ash and Recronfibre is used for soil stabilization it will reduce the environmental hazardous caused by Recronfibre. It will be one of the cheapest method for ground improvement.

RESULT-

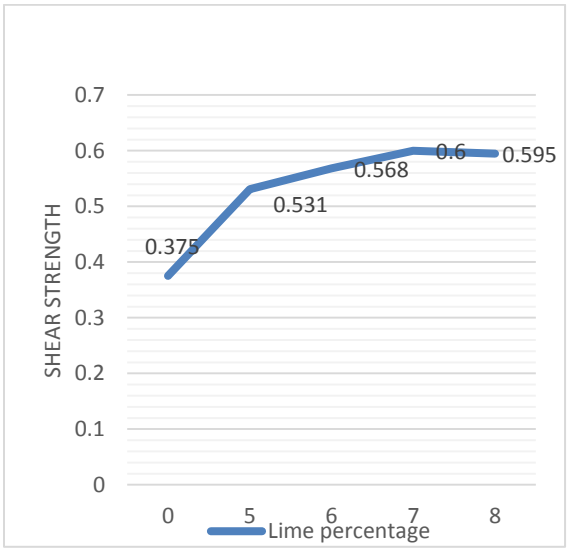
SHEAR STRENGTH OF FLY ASH WITH DIFFERENT LIME %



SHEAR STRENGTH OF FLY ASH WITH 6mm RECRON



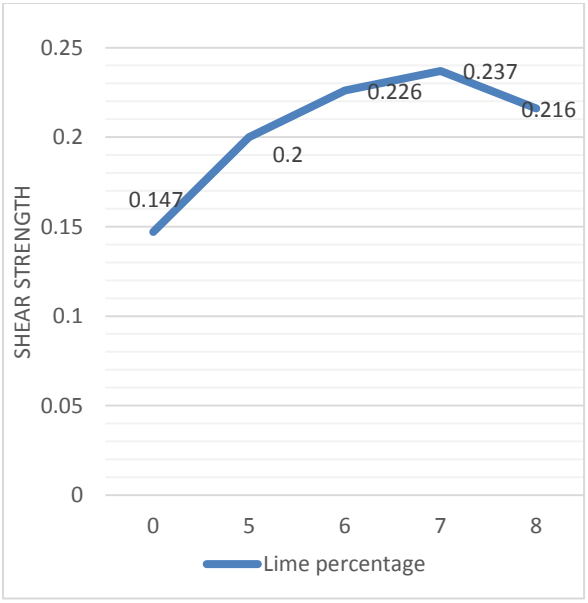
2% FIBRE



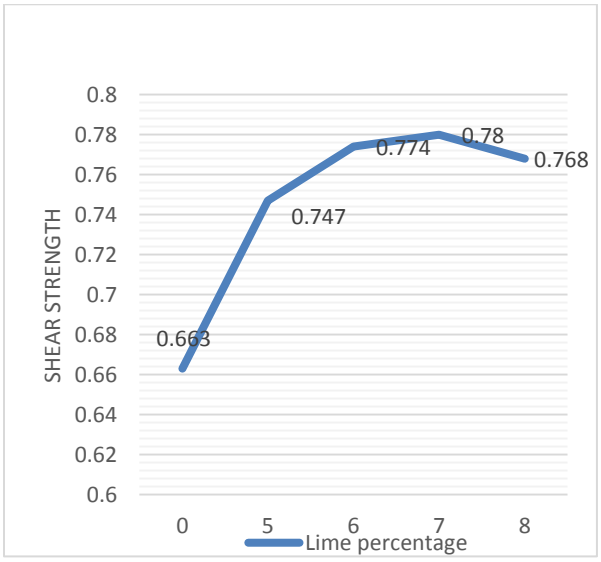
FIBRE

SHEAR STRENGTH FOR 6mm RECRON FIBER WITH DIFFERENT LIME %

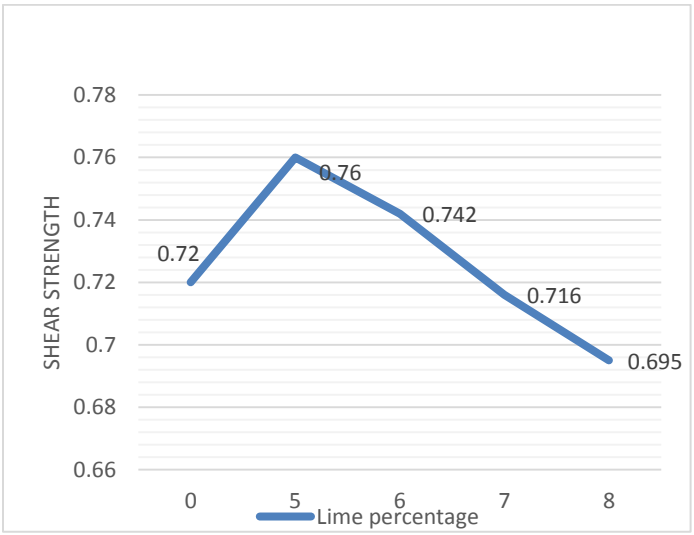
1% FIBRE



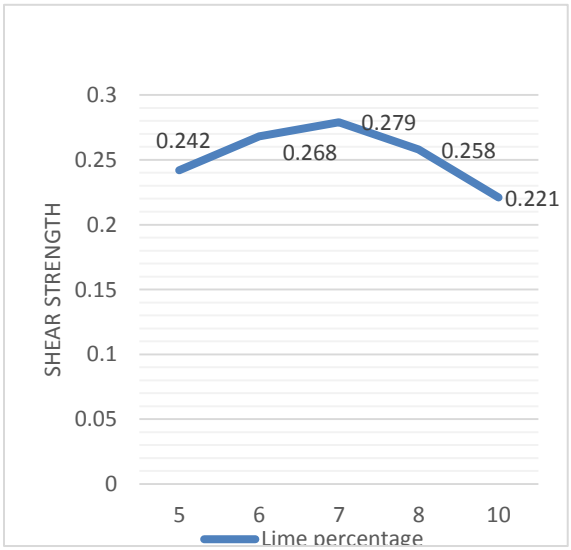
3% FIBRE



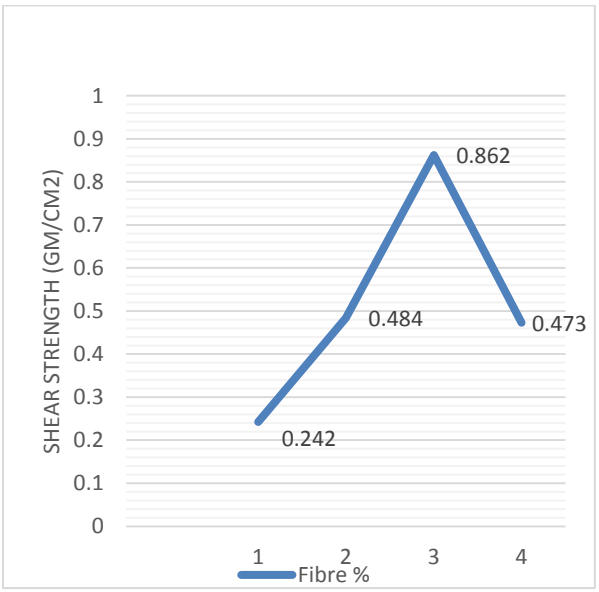
4% FIBRE



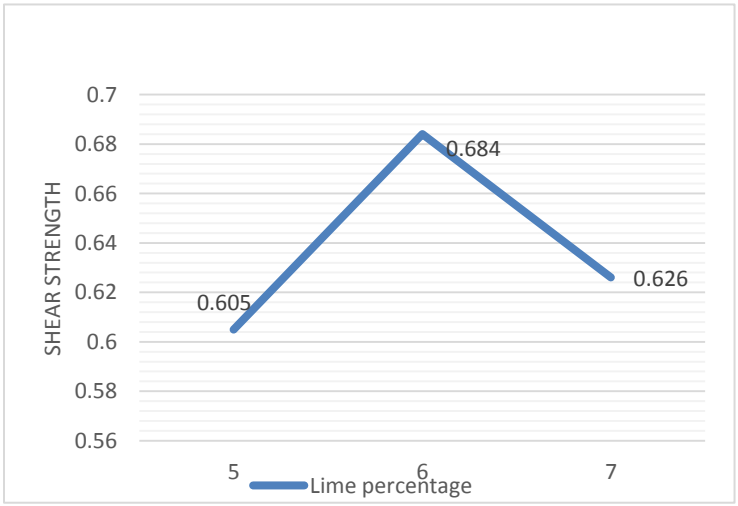
1% FIBRE



SHEAR STRENGTH OF FLY ASH WITH 12mm

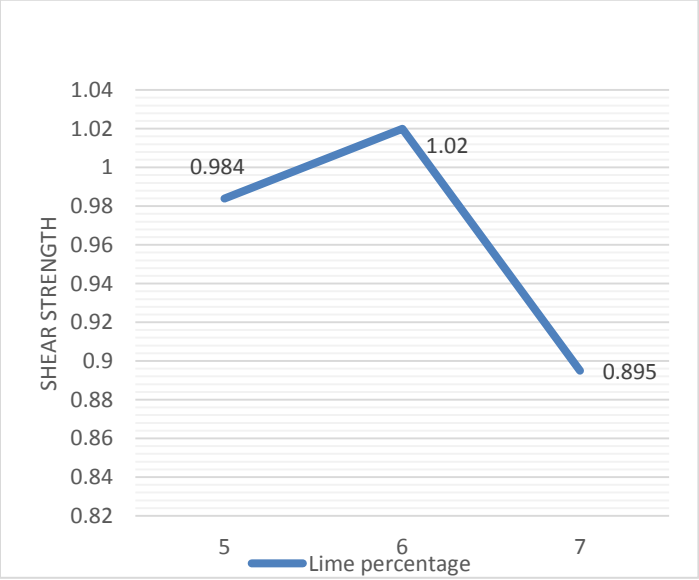


2% FIBRE

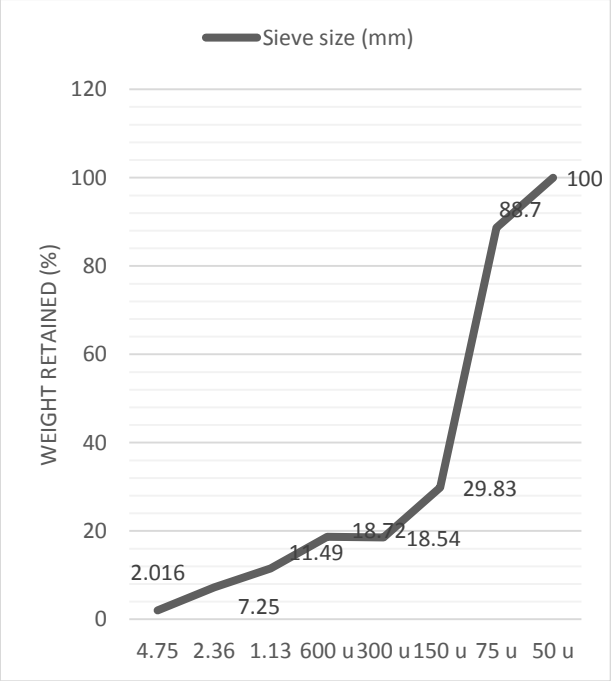


SHEAR STRENGTH OF FLY ASH WITH 12mm RECRON FIBRE WITH DIFFERENT LIME%

3% FIBRE



Grain size distribution curve



Specific gravity=2.57

- D_{10} =224.3
- D_{30} =199.735
- D_{60} =162.5
- C_u= 0.723
- C_c =1.09

CONCLUSION

The Shear Strength will vary with different lime and fibre % by weight.

1. **For 1% fibre by weight:-**

Only fibre Shear stenht (S)= 0.147

with 5% lime S=0.2. So there is an **increase in 36% of strenght**

with 10% lime S= 0.182. So there is **an increase in 23.8% strength**

But if we compare the shear strength with 5% and 10% lime added with 1% fibre we get,

With 5% limes=0.2 and with 10% lime S=0.182. So there is a decrease in strength of 9%

So as the lime will vary from 5% to maximum of 10%

2. The optimum amount for 6mm recron fibre **is 3% recron fibre with 7% lime content S=.78**
3. The optimum amount for 12mm recron fibre **is 3% recron fibre with 6% lime content S=1.02**
4. Our study shows that with increase in the amount of fibre shear strength increases, but the value of shear strength starts decreasing after the optimum amount for fibre is attended. Same is seen in the case of lime as well as for the combination of both.
5. Our study proves that Fly ash stabilized with lime and fibre can increase the strength of fly ash which can be used in land fills , as well in place of borrow soils.
6. Fly ash have low specific gravity compared to conventional earth material.

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