Effect of Saw Dust & Recron 3S Fibre on Index and Engineering Properties of the Landfill Soil

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Abstract— Landfill is a method of waste disposal utilizing soil in the elimination of discarded food, fibres and artifacts. About 2/3rd of landfill waste contains biodegradable organic matter from households, business and industries. Masses of waste product place in trenches or in soil encased mounds decay in a soil environment. Soil serves as a lining for the site, as cover, as a physical and chemical renovator. This has led to degradation of physical, chemical and strength characteristics of soil. This research work comprises of using saw dust and recron fibre to increase the soil characteristics. The aim was to increase the soil strength from waste materials. Index properties such as particle sieve analysis, water content, plastic limit, liquid limit and specific gravity were found for virgin soil and soil contaminated with saw dust (5%, 10%, 15%), recron 3s fibre (5%, 10%, 15%) & saw dust + recron fibre (10% + 10%). Experimental work includes Standard Proctor test, Direct Shear Test & permeability performed for Virgin Soil, Soil contaminated with saw dust (5%, 10%, 15%), recron 3s fibre (5%, 10%, 15%) & saw dust + recron fibre (10% + 10%).

Keywords: Saw Dust and Recron 3s Fibre

I. INTRODUCTION

A. *Need for Soil Stabilization*

Soil stabilization is the alteration of soils to enhance their physical properties. Stabilization can increase the shear strength of a soil or control the shrink-swell properties of a soil, thus improving the load bearing capacity of a sub-grade to support pavement and foundation. Soil stabilization can be utilized on roadways, parking areas, site development project, airport and many other situations where sub-soil are not suitable for construction. Stabilization can be used to treat a wide range pf sub-grade materials, varying from expansive clays to granular materials

B. *Overview: - Soil Stabilization*

Soil stabilization a general term for any physical, chemical, mechanical, biological or combined method of changing a natural soil to meet an engineering purpose. Improvements include increasing the weight bearing capabilities, tensile strength, and overall performance of in-situ subsoils, sands, and waste materials in order to strengthen road pavements. Some of the renewable technologies are: enzymes, surfactants, biopolymers, synthetic polymers, co-polymer based products, cross-linking styrene acrylic polymers, tree resins, ionic stabilizers, fiber reinforcement, calcium chloride, calcite, sodium chloride, magnesium chloride and more. Some of these new stabilizing techniques create hydrophobic surfaces and mass that prevent road failure from water penetration or heavy frosts by inhibiting the ingress of water into the treated layer.

II. CHARACTERISTICS OF SOIL

Sr No.	Characteristics	Reading	Unit
1	Gravel	0	%
2	Sand	81.55	%
3	Silt + Clay	18.45	%
4	Liquid limit	26.98	%
5	Plastic limit	15.03	%
6	Optimum moisture content	19	%
7	Maximum dry density	1.8	gm/cm^3
8	Cohesion	0.138	kg/cm^2
9	Angle of internal friction	23^0	degree
10	Specific Gravity	2.64	

III. MATERIALS AND METHOD

A. *Landfill Soil (PIRANA)*

The virgin soil has been procured from a site of PIRANA area in Ahmedabad, Gujarat. Silt is granular material of a size between sand and clay, whose mineral origin is quartz and feldspar. Silt may occur as a soil (often mixed with sand or clay) or as sediment mixed in suspension with water (also known as a suspended load) and soil in a body of water such as a river. It may also exist as soil deposited at the bottom of a water body, like mudflows from landslides. Silt has a moderate specific area with a typically non-sticky, plastic feel. Silt usually has a floury feel when dry, and a slippery feel when wet. Silt can be visually observed with a hand lens, exhibiting a sparkly appearance. It also can be felt by the tongue as granular when placed on the front teeth (even when mixed with clay particles).

B. *Saw Dust*

Sawdust or wood dust is a by-product or waste product of woodworking operations such as sawing, milling, planning, routing, drilling and sanding. It is composed of fine particles of wood. These operations can be performed by woodworking machinery, portable power tools or by use of hand tools. Wood dust is also the by-product of certain animals, birds and insects which live in wood, such as the woodpecker and carpenter ant. In some manufacturing industries it can be a significant fire hazard and source of occupational dust exposure.

C. *Recron 3s Fibre*

Recron 3S is a modified polyester fibre. It is generally used as secondary reinforcing material in concrete and soil to increase their performance. Recron 3S sample used in experiment was of 12mm length and manufactured by Reliance Industries Limited. Physical parameters of Recron 3S fibre as obtained from RIL Safety data sheet are given in TABLE. Use of Recron-3S as a reinforcing material is to

increase the strength in various applications like cement based precast products, filtration fabrics etc. It also provides resistance to impact, abrasion and greatly improves the quality of construction during foundation, retaining wall design etc. Polypropylene fibre is the most widely used inclusion laboratory testing of soil reinforcement Currently Polypropylene fibre is used to enhance the soil strength properties, to reduce the shrinkage properties and to overcome chemical and biological degradation.

IV. PREPARATION OF SOIL MIXTURE

The selected percentage of saw dust and recron fibre at rate of 5%, 10% and 15% of the dry weight of natural untreated soil. The soil-additive mixture were prepared by mixing saw dust and recron fibre with soil sample at different proportion.

V. EXPERIMENT PERFORMED

Different test was performed on soil and soil with saw dust and recron fibre at different proportion. The test performed are Atterberg's limit, Specific gravity, Fine sieve analysis, Standard proctor test and Direct shear test.

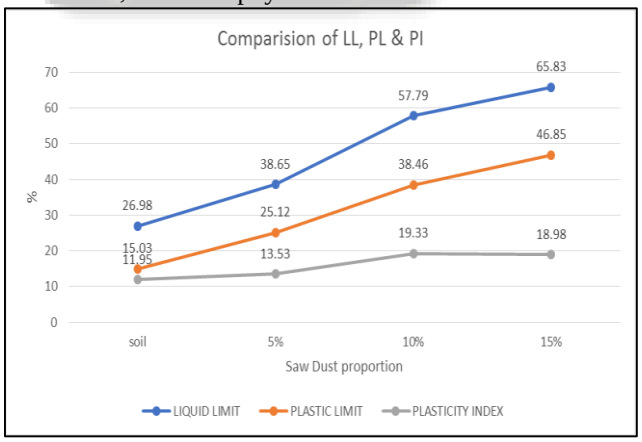
VI. TEST RESULTS AND GRAPH

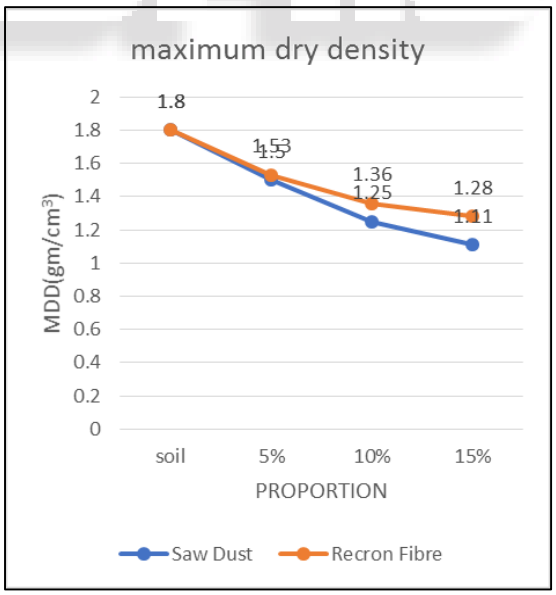
		GRAVEL (%)	SAND (%)	SILT+CLAY (%)	LL (%)	PL (%)	PI (%)	OMC (%)	MDD (gm/cm^3)	C (km/cm^2)	Φ (degree)	Specific gravity
	SOIL	0	81.55	18.45	26.98	15.03	11.95	19	1.8	0.138	23^0	2.64
SAW DUST	5%	0	77.45	22.55	38.65	25.12	13.53	28	1.5	0.14	25^0	2.55
	10%	0	77.9	22.1	57.79	38.46	19.33	37.5	1.25	0.16	30^0	2.46
	15%	0	81	19	65.83	46.85	18.98	49.9	1.11	0.17	32^0	2.39

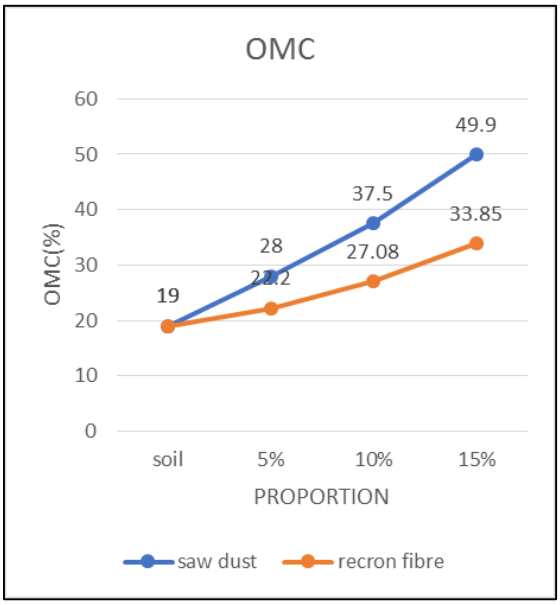
		OMC (%)	MDD (gm/cm^3)	C (km/cm^2)	Φ(degree)	Specific gravity
	SOIL	19	1.8	0.138	23^0	2.64
RECRON FIBRE	5%	22.2	1.53	0.15	26^0	2.08
	10%	27.08	1.36	0.2	31^0	1.97
	15%	33.85	1.28	0.26	32^0	1.9

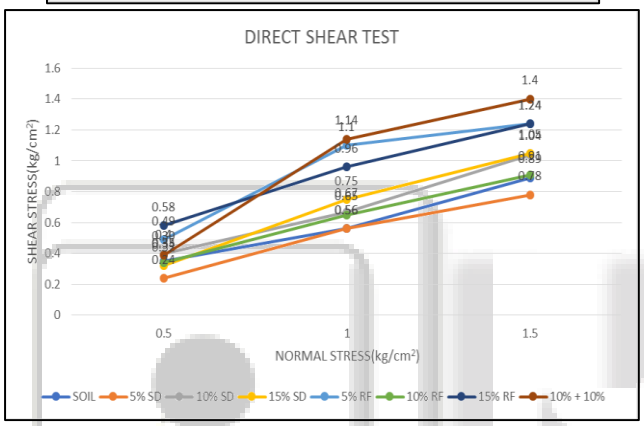
		OMC (%)	MDD (gm/cm^3)	C (km/cm^2)	Φ (degree)	Specific gravity
	SOIL	19	1.8	0.138	23^0	2.64
SAW DUST+ RECRON FIBRE	10% + 10%	44.95	1.19	0.15	44^0	2.02

Here the test like liquid limit, plastic limit particle sieve analysis was not able to be performed with soil and recron fibre, due to its physical structure.









VII. Conclusion

- On adding 5%, 10% and 15% proportion of Saw Dust in virgin, we observed that the value of Optimum Moisture Content(OMC), Cohesion(C) and Angle of Internal Friction(φ) increases while Maximum Dry Density(MDD) decreases.
- On adding 5%, 10% and 15% proportion of Recron Fibre in virgin, we observed that the value of Optimum Moisture Content(OMC), Cohesion(C) and Angle of Internal Friction(φ) increases while Maximum Dry Density(MDD) decreases.
- On adding 10% + 10% proportion of Saw Dust and Recron Fibre respectively in virgin, we observed that the value of Optimum Moisture Content(OMC), Cohesion(C) and Angle of Internal Friction(φ) increases while Maximum Dry Density(MDD) decreases.

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