

Research Article

**A Review on Replacement of Soil with Soil plus Sawdust Powder**

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**Abstract**

Well for long time, we are facing problem like failure of the structure, one of the reasons behind this is swelling of soil. It is due to unstable nature of the soil. It's property varies from hard to soft and dry to wet. It exhibits swelling and shrinkage with different water content. As a result of this, structure undergoes settlement and differential movements. Through this project we are about to reduce the swelling & shrinkage of soil by stabilizing it by using saw dust powder. The soil is initially tested without any stabilizing agent. Later various proportions of sawdust powder is added and tested to find in which proportion the soil is more stable. Soil stabilization is the process of improving the engineering properties of the soil and thus making a more stable. It is required the soil available for construction is not suitable for the intended purpose. In its broadest senses, stabilization includes compaction, reconsolidation, drainage, and many other such process. A cementing material or a chemical is added to a natural soil for the purpose of stabilization.

Utilization of saw dust as ash in geotechnical applications is likely provides a better solution. Keeping this in view, an extensive experimental study was carried out to demonstrate the soil improvement prospective of saw dust ash (SDA) by performing California bearing ratio (CBR) and unconfined compression strength tests. The experimental study has revealed that the addition of SDA results a significant increase in CBR and unconfined compressive strength. Furthermore the values of CBR obtained are within the limits recommended by the Asphalt Institute for Highway sub-base and sub-grade. Thus from the present study it is concluded that SDA, an industrial waste, is a cheap satisfactory stabilizing agent for sub-base and base course in clayey fills; although its performance can be improved by combining it with other bonding materials such as saw dust powder

**Key Words:** Clay soil, Liquid limit, Plastic limit, Moisture content, Saw dust powder.

**1. Introduction**

Soil adjustment is the way toward treating a dirt in such a way to keep up, adjust or improve the exhibition of the dirt. The adjustments in soil properties are realized by the fuse of added substances or by mechanical mixing of distinctive soil types. It very well may be likewise alluded to as the procedure of changing the dirt properties to improve quality and toughness. The

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utilization of soil adjustment thinks that its way as relinquished destinations because of bothersome soil bearing limits significantly expanded, and the result of this was the shortage of land and expanded interest for regular assets.

The most normally utilized strategies are utilizing added substances like concrete, lime or flyash or by mechanical methods, for example, a vibro compaction. The reasonableness of the added substance and its impact on the soil properties can be resolved utilizing research facility tests followed by field tests. The primary properties of soil which are important to engineers are volume dependability, quality, compressibility, penetrability and toughness.

The basic role of strengthening soil is to expand the bearing limit and decrease the sidelong distortions. The arbitrary appropriation of fiber for the most part interlock soil molecule what's more, totals into a solitary rational blend. Sawdust is the term given to the item framed after granulating of wood log.

Immense amount of sawdust is created because of urbanization. The sawdust subsequently created causes harm to wellbeing and condition. As a strategy for their transfer the sawdust is arranged in open regions and landfill causing natural contamination and landfill issues.

The utilization of sawdust debris in soils can end up being a powerful technique for the transfer of sawdust. This examination points in finding the reasonableness of sawdust as a stabilizer in soils.

The figure appeared beneath shows the inappropriate transfer sawdust debris close the sawmills. It very well may be seen that sawdust even forces danger to the best possible working of the machine

These days, immense result strong materials (squanders) are accessible like fly debris, rice husk debris, reeds and papyrus remains which can be utilized as soil stabilizer rather than expensive lime or concrete. There are progressing research considers concerning the plausibility of utilizing other normally happening materials, for example, remains of horticultural waste items for soil adjustment in light of their pozzolanic nature. Saw dust is one of the results from timber industry and wood cutting industrial facilities.

The present examination researches whether the sawdust remains (SDA) can be utilized as an added substance to balance out delicate clayey soils by improving their geotechnical properties which will support the utilization of SDA as a stabilizer for clay soil to take care of street disappointment issues.

### **1.1 Soil Stabilization:**

Soil stabilization means the improvement of stability or bearing power of the soil by the use of controlled compaction, proportioning and/or the addition of suitable admixture or stabilizers

#### **Benefits of soil stabilization**

1. Higher resistances (R) values.
2. Reduction in plasticity.

3. Lower permeability.
4. Reduction of pavement thickness.
5. Increase of bearing capacity.
6. Reduction in settlement.

### **1.2 Saw Dust Powder:**

The saw dust used for the study is collected from locally available Timber milling factory. The saw dust was air dried to remove moisture from it. A significant utilization of sawdust is for particleboard; coarse sawdust might be utilized for wood pulp.

Sawdust has an assortment of other commonsense uses, including filling in as a mulch, as an option in contrast to dirt feline litter, or as a fuel. Until the approach of refrigeration, it was frequently utilized in icehouses to keep ice solidified throughout the mid year



### **Advantage of Saw dust**

When composting sawdust, you will want to treat the sawdust just as you would dry leaves, meaning that you will want to add it in an approximately 4:1 ratio of brown to green materials.

Sawdust actually makes a great amendment for your compost pile, as it will add a filler that is somewhat absorptive and will wick up water from rain and juices from the green material, which help with the composting process.

The one thing to be mindful of is if you will be composting sawdust from chemically treated wood. In this case, you will want to take a few extra steps to ensure that these chemicals work

### **1.3 Clay Soil:**

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It is a mud or soil that is inclined to huge volume changes (expanding and contracting) that are legitimately identified with changes in water content. Soils with a high substance of far reaching minerals can shape profound splits in drier seasons or years



### **Compounds of Clay Soil**

Clay materials are composed of solid, liquid and vapour phases. The solid phases are of mineral and organic phases that make up the framework of the clay materials. The mineralogy can be broadly subdivided into the clay and non-clay minerals, including poorly crystalline, so-called ‘amorphous’ inorganic phases. By definition, minerals are crystalline solids with well-ordered crystal structures but clay minerals and other inorganic phases in clay materials are often poorly crystalline compared to minerals such as quartz and feldspar.

## **2. LITERATURE REVIEW**

Extensive soils are an overall issue that represents a few challenges for structural specialists. They are viewed as a potential common peril, which can make broad harm structures if not sufficiently treated. Far reaching soils cause more harm to structures, especially light structures and asphalts, than some other normal danger, including quakes and floods .On the other hand mechanical waste transfer is another fundamental issue that the specialists confronting. Marble dust, saw residue and coir essence are the locally accessible squander materials which don't have a decent transfer technique. Their consolidation when added to far reaching soil has been considered in this paper. Coming up next are the writing concerningsubject.

### **2.1 Venkatesh and Srinivasa Reddy (2016)**

saw that 5. 4% of dry thickness was expanded likewise of 2% of WSDA and at that point dry thickness was diminished bit by bit on expanding the level of Waste Saw Dust Ash. Porousness of soil was likewise diminished.

### **2.2 Koteswara Rao et al (2012)**

Sawdust was blended in soil in 5%, 10%,15%, 20% and 25% in dry load of the dirt. It was discovered that the O.M.C of the marine earth diminished by 15.37% on expansion of 15%

Sawdust and it has been additionally diminished by 17.91% at the point when 4% lime was included. The use of mechanical squanders like saw dust is a choice to decrease the development cost of streets especially in the country regions of creating nations

### **2.3 Swati Sucharita Rout et al., (2017)**

Contemplated the impact of the incorporation of fly debris and coir fiber on quality properties of delicate soil. Fly debris also, coir fiber expanded CBR and dry thickness.

### **2.4 Wajid Ali Butt, Karan Gupta and K.N Jha (2016)**

directed broad exploratory exhibit the dirt improvement planned of saw dust debris (SDA) by performing California bearing proportion (CBR) and unconfined pressure quality tests.

The trial study has uncovered that the expansion of SDA results a critical increment in CBR and unconfined compressive quality.

### **2.5 Prof. Brajesh Mishra (2014)**

explored about the designing conduct of dark cotton soil and its adjustment by utilization of lime. The tests were directed for properties like atterberg limit, CBR esteem, free swell file and compaction factor. He at long last presumed that 5% incomplete supplanting of soil with lime is ideal to settle the dark cotton soil. He presumed that 5% incomplete substitution of fly- debris brought about diminished fluid breaking point (15.27%) and growing and it likewise expanded the CBR esteems.

### **2.6 Prof. George Rowland Otoko (2014)**

researched about the adjustment of Nigerian Deltaic Laterites with saw dust debris. The dirt properties were recognized by directing trial of fluid farthest point, plastic utmost, shrinkage limit, free swell file, versatility file, MDD with OMC, UCC and CBR. He at long last presumed that physical properties and building qualities

Of Nigerian deltaic laterites were improved with expansion of 4% of saw dust debris, and there was likewise increment in 14% of CBR and UCC values. He additionally presumed that there was decrease in cost of development in light of the utilization of strong waste.

### **2.7 Prof. Karthick (2014)**

Learned about the dirt adjustment by incompletely supplanting red soil with Fly Ash. He led different tests, for example, CBR, explicit gravity, MDD with OMC, UCC, fluid farthest point and plastic breaking point. He at long last finished up that 9% fractional substitution of fly debris in the dirt outcomes in improved properties and he additionally said that those dirt demonstrated great bearing limit

### **2.8 Sahoo, Jagdish 2010**

Inspected the impact of profound adjustment of soil with fly debris for his Master's theory. He performed unconfined pressure and triaxial pressure tests to check the reasonableness of soil with fly debris. It was discovered that the coal debris class H (This kind of debris H is a result of

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hard coal ignition. The ignition happens in a flowing fluidized bed evaporator at around 800°C) is the best and a more grounded material is gotten if lime and concrete is utilized with fly debris in soil. Niklas additionally derived that on the off chance that the dirt with fly debris is left to be restored, at that point the quality is somewhat higher following 56 days than following 7 days suggesting that some pozzolanic responses do occur. Quality Characteristics of Fly Ash Mixed with Lime Stabilized Soil were contemplated in 2010 asserting that expanding the fly debris content up to 15% for the dirt examples demonstrated a huge change in the unconfined compressive quality.

The test uncovered that the ideal substance of admixture for accomplishing most extreme quality is around 15% fly debris blended in with 4% lime of the dry load of the dirt

### **2.9 Joseph et al.**

Geotechnical properties of South- western Nigerian Soil was again tried by Ogunribido(2012) who has demonstrated that sawdust debris is a compelling soil stabilizer for lateritic soil and street quality can be upgraded by its expansion into soils. He further indicated that shear quality can be expanded from 50.92 to 71.07kN/m<sup>2</sup> and unconfined compressive quality from 101.4 to 142.14kN/m<sup>2</sup> consequently beating the issue of street disappointment in Nigeria. Also, S.Kanaka (2012) has adequately demonstrated the positive effect of sawdust on Marine Clays who has demonstrated that fluid farthest point of soil diminishes at 20% Saw Dust, the Free Swell Index of soil is decreases decently at 20% Saw Dust, expansion of little level of Gypsum lessens the solidifying procedure, and saw residue can conceivably settle the extensive soil exclusively.

### **2.10 Parte Shyam Singh and Yadav R K (2014)**

presents the consequences of a lab study embraced to examine the impact of marble dust on the list properties of dark cotton soil. The test outcomes shows a noteworthy change in the consistency cutoff points of tests containing marble dust. The fluid point of confinement would diminish from 57.68% to 33.9%. The versatility list diminished from 28.35% to 16.67% and shrinkage limit expanded from 8.06% to 18.39% with the expansion of marble dust from 10% to 40% of the dry weight of dark cotton soil.

### **2.11 Prof. Dr. Robert M. Streams (2009)**

Learned about the dirt adjustment utilizing fly debris and rice husk debris. He had directed tests, for example, Compaction test, UCS, CBR and free swell file. The test outcomes presumed that, by expanding rice husk debris to the dirt outcomes in increment of CBR worth, UCS and swell derivation. With expanded fly debris content, there was an expansion in the pressure strain conduct of bound compressive quality. He presumed that ideal fly debris and rice husk debris content was seen as 25% and 12% individually. He likewise finished up those dirt can be enthusiastically suggested for fortifying the sub grade of extensive soil.

### **2.12 Prof. Ravi (2016)**

learned about the attributes of earth soil by utilizing copper slag adjustment. In this paper, he tried the CBR and Max thickness, OMD relationship. He watched higher CBR esteems in 30% substitution of copper slag and this was additionally filled in as great congruity for the

adaptable asphalt with synchronous decrease in the sub base course thickness. He atlast inferred that the expansion of 30% copper slag with 70% BC soil was the reasonable adjustment proportion which expanded all attributes of sub grade prerequisite

### **2.13 Prof. Mohammed (2015)**

researched about the improvement in soil properties of Expansive soil by utilizing copper slag. The dirt properties like Grain size investigation, fluid point of confinement, plastic cutoff, versatility record, compaction test, direct shear test and CBR were resolved. He presumed that copper slag 40% and Black cotton soil 60% was ideal and it indicated the expansion in estimation of explicit gravity and CBR. He at long last presumed that such soil can be viably utilized in street dike sub base and sub grade.

### **2.14 Prof.Jinkachandrshekher (2015)**

checked on usage of waste material "copper slag" in geotechnical applications The dirt example was tried for explicit gravity, grain size conveyance, free swell file, compaction factor and CBR. The outcomes were watched for 60% copper slag and 40% dark cotton and it was inferred that the sub grade, sub base and building conduct of soil was improved. And furthermore the dike development, land recovery of soil conditions was expanded.

### **2.15 Prof.Jayapal (2014)**

talked about the correlation of various admixtures utilizing feeble soil adjustment. In this paper, admixtures, for example, quarry dust, fly debris and lime were looked at. The tests, for example, fluid point of confinement, plastic utmost, adjusted delegate compaction, sifter investigation, differential free swell and CBR were led. He presumed that the expansion of quarry residue, lime and fly debris had not forestalled the growing nature. He likewise reasoned that there was increment in the CBR esteem with the incomplete substitution of 20% quarry dust which thusly diminished the asphalt thickness of street development

## **3. Conclusion**

The ideal decrease in porousness of a dirt happens when 12% sawdust debris is added to the dirt.

- The quality parameters are improved by expanding the amount of sawdust debris into the dirt.
- Although the impact of sawdust debris content on shrinkage farthest point of soil was not tried, yet one of the examples with 12% sawdust debris expansion indicated shrinkage estimation of 38% when contrasted with its underlying estimation of 29.15%. As far as possible expanded with the expansion of SDA into the dirt. Since as far as possible means that extensiveness of soil, it is inferred that expansion of SDA lessens the development of soil. Additionally, it is more uncertain going to create splits whenever utilized for dikes.
- The compaction tests demonstrated that Dry Density of the compacted soil with SDA was upgraded. Such a reduced soil will be helpful for the development of establishments over it since

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it will have a high bearing limit and greater capacity to withstand the static burden while diminishing the pace of settlement.

- Further expansion of SDA isn't alluring since as far as possible surpasses which isn't reasonable for dam development.

The sawdust debris, generally speaking positively affected the properties of soil. Along these lines a dirt with legitimate amount of SDA is prescribed for use in geotechnical works. Many structures have bombed because of shear disappointment in past. This and the SDA transfer issue can be stayed away from, all things considered, and increasingly stable structures can be ensured in future.

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