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Characterization of Dredged Material from Flood Spill Channel of Jhelum River and its Stabilization Using Surkhi

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Abstract: *Dredging of the river bed and flood channels generates dredged soil in large quantity posing serious health and environmental problems. Concern over environmental effects of dredging, disposal and the increasing unavailability of suitable disposal sites, has put pressure for characterization of this material. This material can be a valuable resource for many practical purposes such as fill material, subgrade construction, reclamation, landscaping, agriculture, landfill covers, constructing wetlands for water quality improvement, creation of islands, wildlife habitat wetlands, and amongst others. But on the basis of preliminary geotechnical investigations, it has been observed that in-situ dredged soil is not suitable for various beneficial applications. Therefore, an attempt has been made to study engineering properties of surkhi stabilized dredged soil for its utilization in bulk in various Geotechnical applications. The beneficial effects of surkhi on the performance of soils have been widely documented. In this study, dredged soil was collected from different locations of flood spill channel. Test specimens were prepared with dredged soil using a range of surkhi (by dry weight of the soil) at Optimum moisture content and subjected to different tests as per relevant standard procedures. On the basis of Geotechnical investigations, it is observed that the addition of surkhi improved the drying rate, workability, compaction compressibility and strength characteristics of the soils. Significant improvement in unconfined compressive strength and CBR value are attained by surkhi treatment of these soils. The main contributions of this study is to practice on quantifying improvement in mechanical behaviour due to surkhi treatment. On the whole, the main objective of this study is to successfully manage dredged soil in a manner that is protective of human health and the environment in and around Jhelum River.*

Keywords: *Dredging, Jehlum River, Surkhi, Soil Stabilisation, Soft Soil*

Introduction

Occurrence of floods in the Kashmir valley in September 2014 compelled the Government of Jammu and Kashmir to take the necessary steps in order to avoid the similar situation in near future. Eventually the Government decided to start dredging of Jhelum and it spill channel, in order to increase their capacity. As a result, a large quantity of dredged material is obtained and there should be a proper plan in advance for the utilization of such large quantity of dredged material. Soft Soil deposits usually have a low bearing capacity and undergo excessive settlement over a long period of time. One of the important problems in geotechnical engineering is often to deal with the reliable assessment behaviour of soft soils. Using such materials either as a foundation medium or construction material is almost impossible without some means of improving their adverse properties. This study deals with the soft soil deposits of solid waste generated by dredging the flood spill channel of Jhelum River, Srinagar. Jhelum River is essentially the lifeline of Kashmir valley, forming the backbone of all its economic activities. However, Jhelum River is also the cause of large and small scale flooding in the region. Floods have been reported frequently throughout history in Kashmir. One of the most disastrous flood occurred in September 2014, in which a large area of South and Central Kashmir, especially the main city of Srinagar was submerged, which caused intolerable devastating damage to residential buildings and shopping complexes. In view of this, various flood control measures and methods have been recommended from time to time.
One among them is flood spill channel which carry excess water from main river body during flooding from PadshahiBagh, Srinagar and running into Wular Lake. But unfortunately, the present capacity of the channel is 5000 cusecs, which is significantly less than its design capacity of 17000 cusecs in 1902. This decrease is due to the encroachments and sediment deposition in the river and flood channel over the years. In such a scenario, the threat of flooding is evident and thus various proposals are being formulated, one among them being dredging out sediment deposited in the bed of the flood channel.

Experimental Work and Sample Preparation

The dredged material can be utilized in bulk, only in geotechnical engineering applications such as construction of embankments, as a backfill material, a sub- base material, and foundation base material or in land- fills etc. Thus, through literature review it is observed that several attempts have already been made by researchers for effective utilization of dredged material as civil engineering construction material. Due to scarcity of land resources buildings are being

constructed multi-storey now a days which require high strength material below foundation base. But from the past research it is clear that utilization of dredged material due to its less strength than the natural soils cannot serve the purpose. Limited researchers have focused on the improvement of geotechnical properties of dredged soil by addition of surkhi. However, less field application is made due to lack of sufficient literature.
This study aims at evaluating the basic properties of dredged soil and its suitability as a construction or foundation material. Also, the basic properties of the surkhi obtained from the brick kiln are evaluated. Then different percentages of surkhi are added to the dredged material and tested for different strength tests. Direct shear, unconfined compressive strength, California bearing ratio tests were performed on these samples as per the guidelines of IS-2720.

Results

S.no	Parameter	Dredged Material	Surkhi	5% SK+95 % DS	10% SK+90% DS	15% SK+85% DS	20% SK+80 % DS
1	Specific Gravity	G_{DS}=2.51	G_{SK}=2.75	2.522	2.534	2.546	2.555
2	Coefficient Of Uniformity, C_u	18	16	-	-	-	-
3	Coefficient of Curvature, C_c	10.8	2.3	-	62	63	-
4	Liquid Limit	33.97	-	-	-	-	-
5	Plastic Limit	24.51	-	-	-	-	-
6	Plasticity Index	9.46	-	-	-	-	-
7	Soil Classification	CI	-	-	-	-	-
8	Dry Density, KN/m^3	15.83@22% WC	-	15.91@22%WC	16.15@20%WC	16.32@20%WC	16.51@20%WC
9	Average Compressive Strength, Kg/cm^2	1.822	-	2.104	2.2440	2.3996	2.5901
10	Cohesion, KN/m^2	56	-	-	62	63	65
11	Angle of Internal Friction, Φ	16^o	-	-	21^o	25^o	27^o
12	California Bearing Ratio	1.545	-	-	2.08	3.07	4.50

Observations

During the course of the present study following observations were made:

- Dredged soil mainly consists of poorly graded silty sand with appreciable fines.
- The suitability number of dredged soil is high, making it unfit as the fill material.
- The Specific gravity value of dredged soil is low than the natural soils, classifying it as a weak material.
- The value of MDD of dredged soil is low with a high value of OMC, due to its poor gradation.
- The CBR value of the dredged soil is also low, which is also a suggestive of its weak nature. It restricts its use as a foundation material, sub-base and sub-grade material.
- The value of shear strength of dredged soil is also low compared to other natural soils. The value of angle of internal friction is low duo to its cohesive nature.
- Surkhi is a well graded sand with appreciable sand.
- The value of specific gravity of surkhi is in the range of other coarser materials.
- The values of MDD of surkhi is high with a low value of OMC.
- The value of shear strength of surkhi is high due to a high value of angle of internal friction.
- Thus, adding surkhi-a waste product in brick kilns will improve the engineering behaviour of dredged soil.

Conclusions & Recommendations

The present study brings out the two- fold advantage. First, to avoid the tremendous environmental problems caused by large scale production of surkhi in brick kilns and second, to help in sustainable development of environment by using stabilized dredged soil in the following applications:

- Use as a foundation material.
- Use as sub- grade material.
- Use in construction sub-base and base.
- Use in construction of embankments and dams.
- As a light weight fill material over soil of low bearing capacity.

References

1. IS:2720 -Part 1 (1980) Indian standard for penetration of soil samples BIS, New Delhi.
2. IS:2720-Part 3 (1989) determination of specific gravity (sec.1, fine grained soils), BIS,New Delhi.
3. IS: 2720-Part 5 (1985), determination of liquid and plastic limit, BIS, New Delhi.
4. IS:2720-Part 4 (1985), methods of test for soils, grain size analysis, BIS, New Delhi.
5. IS:2720-Part 7 (1980), determination of water content-dry density relation using light compaction, BIS, New Delhi.
6. IS:2720-Part 10 (1973), determination of shear strength parameters by unconfined compression test, BIS, New Delhi.
7. IS:2720-Part 13 (1986), BIS New Delhi
8. Raj P .Purussottama (2005)," Textbook of ground improvement techniques", Luxmi publications Pvt.Ltd.
9. Rogbeck J. Knutz A., "Coal bottom ash as light fill material in construction," waste management, vol.16, No. 1-3, pp.125-128.
10. Taylor, D.W.(1948), fundamentals of soil mechanics , john wily and sons, New York
11. EvangelinRamani Sujatha, Kumara Raja G, Poojitha D, Navroj Ravi and Kumar Abishek (2014), Evaluation of Geotechnical parameters of Sand Silt Clay mixtures obtained from Kollidam Riverbed in Tiruchipalli Tamil Nadu, Electronic Journal of Geotechnical Engineering, vol.19, Bundle Z3, pp. 17361- 17368.
12. Hua Yu and William J. Likos(2014), Beneficial use of Dredged materials in Great Lakes commercial ports for transportation projects, Technical Report, CFIRE 07-06.
13. Manas R. Das, Durga P Subudhi, S. Signum, Amit Das, A.T. Ashutosh, D. Yadav (2014), Geotechnical characterization of Dredged Mud from Chilka Lake, International Journal of Advanced Research in Civil, Structural, Environmental and Infrastructure Engineering and Developing, vol. 2, pp. 36-41.
14. WalidMaherzi and Farouk Ben Abdelghani (2014), Dredged Marine Raw Sediments Geotechnical Characterization for their Reuse in Road Construction, Engineering Journal, vol. 18(4), pp. 27-37.

