

Behavior of Oil Contaminated Clayey Sand as a Construction Material

Abdelkader Zerrouk and C. Vipulanandan, Ph.D., P.E.

Texas Hurricane Center for Innovative Technology (THC-IT)

Department of Civil and Environmental Engineering

University of Houston, Houston, TX, 77204-4003

Tel: (713)743-4278; Email Address: abdzerrouk@yahoo.fr, cvipulanandan@uh.edu

Abstract: In this study the use of contaminated clayey sand with used engine oil as construction material was investigated. The study concerned soaked samples in used engine oil for limited and prolonged time. Unconfined compression tests were conducted on the samples and showed a decrease in strength compared to similar unsoaked samples for 3 different compositions (S80B20, S75B25, and S70B30). Also compactions using Harvard Miniature for different series of compositions: sand & bentonite; sand and kaolinite; sand, bentonite and cement; sand, bentonite and fly ash; sand, bentonite, fly ash and cement were conducted using as a mixing liquid either water or a mixture of different ratio of water and used engine oil. The results showed that the gamma clay increased by the increase of percentage of oil for different composition.

1.Introduction

Used engine oil as a waste not readily avoidable byproduct for which there's no economical demand and for which disposal is required. Less than 50% of this product is collected. The rest is dumped in waste sources where a gallon can pollute one million gallons of clean fresh water. Some studies were carried to make good use of this material. It was successfully used as an air entraining of concrete. Some oil contaminated soils were used in road constructions.

2.Objective

The objective of this study was to investigate the effect of used engine oil on the mechanical properties of clayey sand.

3.Materials and Methods

The Harvard Miniature method was used to compact the soil. Bentonite, kaolinite, fly ash, cement, sand, water and used engine oil were used in different proportions.

4.Results and Analysis

Table 1

Series	Sand (%)	Bent (%)	Kaolinite	Crushed Bricks	FA (%)	Cement (%)	Water (%)	UEO (%)	γ_{dry} g/cu.cm	
1	90	10			-	-	12	-	1.99	
	90	5				5	12	-	2.10	
	90	10				-	-	0	12	2.36
								3	9	2.18
								6	6	2.20
								9	3	2.35
								0	8	2.34
2	80	10			10	-	6	6	2.37	
3	80	10			10		12	-	2.29	

							0	6	2.44
							4	5	2.46
4	80	10			5	5	12	0	2.19
							5	4	2.47
5	80	-	20	-	-	-	8	-	2.45
							5	3	2.55
							0	8	2.52
6		20	-	80			16	-	1.89
							4	12	2.28

Table 2 The Results of Unconfined Compression Test

Sand	Bentonite	Water Content	Soaked in UEO	Nonsoaked in UEO	Failure Load	Loss of Strength %
70	30	15		×	182	34
			×		120	
80	20	12		×	156	41
			×		91	
75	25	15		×	162	31
			×		111	

5. Conclusions

The use of used engine oil:

- Improved γ dry
- Decreased the strength
- Decreased cohesion of high plasticity clay
- The replacement of bentonite by cement or fly ash improved γ dry.

6. Acknowledgments

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7. References

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