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THE EFFECT OF BENTONITE LEVELS ON TIME REQUIRED RH VALUE IN EQUALITY

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ABSTRACT

Negative pore water pressure is an indispensable indicator in unsaturated soil mechanics, so it has a very important function. Measurement suction becomes more important when dealing with bentonite which can be used in containment facilities and hazardous and radioactive waste remediation systems, or as an cover alternativemixing with respect to the time required to obtain equilibrium at the value of RH and temperature.

There are 4 (four) combinations of material mixtures, namely the percentage of bentonite 5%, 10%, 15%, and 20% of the amount of claystone used. In mixing the samples, there were 2 mixing methods where the sample type A (claystone + water) + bentonite and simple type B (bentonite + water) + claystone with a dry density of 1.8 gr/cm^3. The method used in this test is the capacitance relative humidity or the RH sensor.

From the analysis, it is found that the value is influenced by factors ranging from water content where the time obtained is longer with increasing water content, the factor of bentonite where the less bentonite is given, the longer the time obtained. The measurement results are also used to predict the permeability of unsaturated soils.

Keywords*: Bentonite, Clay Stone, capacitance relative humidity, temperature*

1. INTRODUCTION

Soil Suction soil (negative pore water tension) is a basic physical property of unsaturated soil that describes the potential of a certain soil at a certain water content to absorb and retain pore water (Likos and At negative pore water tension (suction) several terms are known, namely, matrix suction, osmotic suction, and total suction.Negative pore water pressure is an indispensable indicator in unsaturated soil mechanics, so it has a very important function. Schanz et al (2010) said that suction were carried out to understand the engineering behavior of unsaturated soils, to semi-arid and dry areas. Soil can be very dry so that suction can reach several hundred MPa.

There are many methods used to measure negative pore water pressure (suction) including the psycroometer, filter paper, chilled-mirror hygrometer, capacitance relative humidity or RH sensor and many more. In this research the method that will be used

isused to measure the total negative pore water tension (suction) is the capacitance relative humidity or the RH sensor.

The purpose of this study was to determine the effect of the percentage of bentonite and claystone mixtures on the sample to obtain how long does it take to get the RH value at equilibrium. With a mixture of 5%, 10%, 15%, and 20% bentonite with a moisture content of 10%, 15% and 20% respectively in claystone samples.

While the limitation of the problem for this research is the mixture of samples used is claystone and bentonite and for the claystone soil to be used comes from the Cempaka area, Banjarbaru City.

2. THEORITICAL STUDY

Negative Pore Pressure (Suction*)*

Negative pore water pressure Soil suction (suction) is a basic physical property of unsaturated soil that describes the potential of a certain soil at a certain water content to absorb and hold pore water (Likos and Lu, 2003). There are several terms that must be known related to suction, namely total suction, matrix suction, and osmotic suction

Bentonite

Bentonite is one of the clays with very high plasticity which contains the mineral Montmorillonite which is very high and expands when it absorbs water (in liquid or gaseous form).

Claystone

is a rock that has a solid structure with more mineral composition than siltstone which has a very fine grain size, claystone can also be interpreted as a type of sedimentary rock that is clay or plastic.

Testing Capacitance relative humidity or RH sensor

The working principle of the capacitance relative humidity sensor is to measure the resistance of two electrodes separated by a polymer film that absorbs or releases water when the humidity (RH) around it changes. RH is obtained from the calibration curve as the relationship between resistance and RH (Arifin, 2008).

3. METHOD

The method used to measure the total suction is the capacitance relative humidity using the RH sensor. Measurement of total suction using the RH sensor was carried out using a mixture of bentonite and claystone samples that had been pulverized that passed the 40 sieve and bentonite. There are 4 (four) combinations of sample mixtures based on dry weight of field conditions, namely the percentage of bentonite 5%, 10%, 15%, and 20% of the amount of claystone used with different moisture content, the explanation of the sample mixture can be seen in table 1 Two different mixing methods were also carried out on the samples eaten, the first method was a mixture (Cs + Bn) + water and the second mixture (Cs + water) + Bn, this was done to determine whether there was an effect of the mixing method.

Made a simple insulating container that serves to maintain a constant temperature made of Styrofoam in the form of a box or box, the container is made to place sensors and samples. The RH sensor used in this study is a type AZ 8835 dual temperature humidity data logger, the device is set to record every 30 seconds with the RH sensor position above the sample. The test scheme and equipment placement can be seen in Figure 1.

Table 1. Conditions for the combination order of *claystone* and *bentonite*

Type Sampel	γd	W	W Cs	W Bn	W Air
	g/cm3	%	gr	gr	gr
A					
Cs 95% Bn 5%	1,8	10	276,92	16,21	20,03
		15	276,92	16,21	34,26
		20	276,92	16,21	48,50
B					
Cs 90% Bn 10%	1,8	10	262,35	32,42	18,39
		15	262,35	32,42	32,63
		20	262,35	32,42	46,86
C					
Cs 85% Bn 15%	1,8	10	247,77	48,64	16,75
		15	247,77	48,64	30,99
		20	247,77	48,64	45,22
D					
Cs 80% Bn 20%	1,8	10	233,20	64,85	15,12
		15	233,20	64,85	29,35
		20	233,20	64,85	43,59

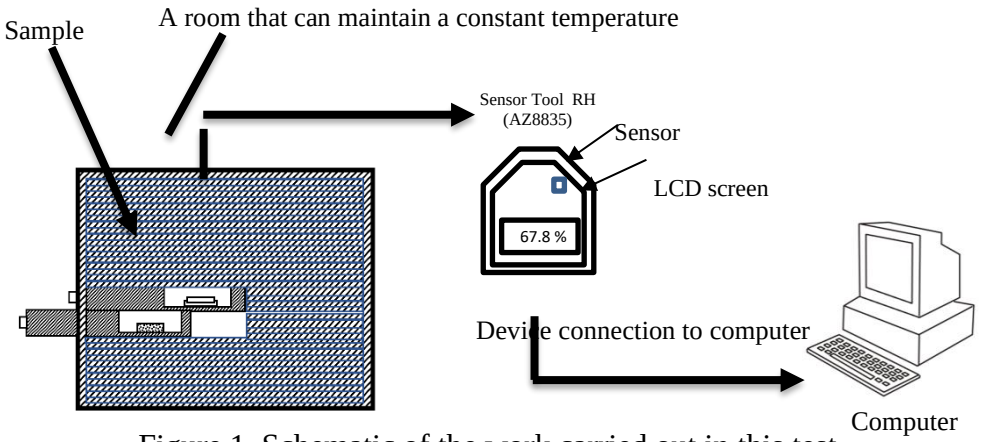

Figure 1. Schematic of the work carried out in this test

4. RESULT AND DISCUSSION

From the results of the tests that have been carried out, the results are in the form of a graph of the relationship between the percentage of bentonite on time which can be seen in Figure 2 and Figure 3.

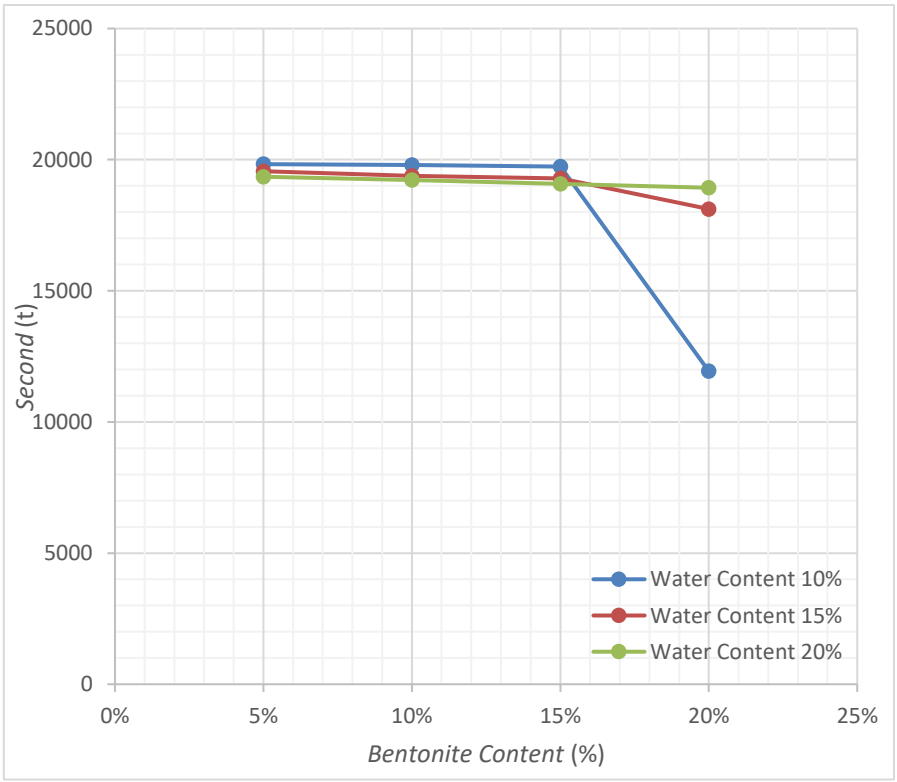

Figure 2. Graph of the Relationship of the Effect of Bentonite Percentage on Time with Mixed Samples (Cs + Water) + Bn

Figure 2. graph of the relationship between the percentage of bentonite and time with the additional percentage of bentonite in the sample with a mixture of (claystone +

water) + bentonite, respectively 5%, 10%, 15%, and 20%. At 10% moisture content, the time value for each additional percentage of bentonite was obtained with values for 19830 seconds, 19800 seconds, 19740 seconds and 11940 seconds. At 15% moisture content, the time value for each bentonite percentage is 19560 seconds, 19830 seconds, 19290 seconds and 18120 seconds. At 20% moisture content, the time value with the percentage of bentonite is 19350 seconds, 19230 seconds, 19080 seconds and 18939 seconds.

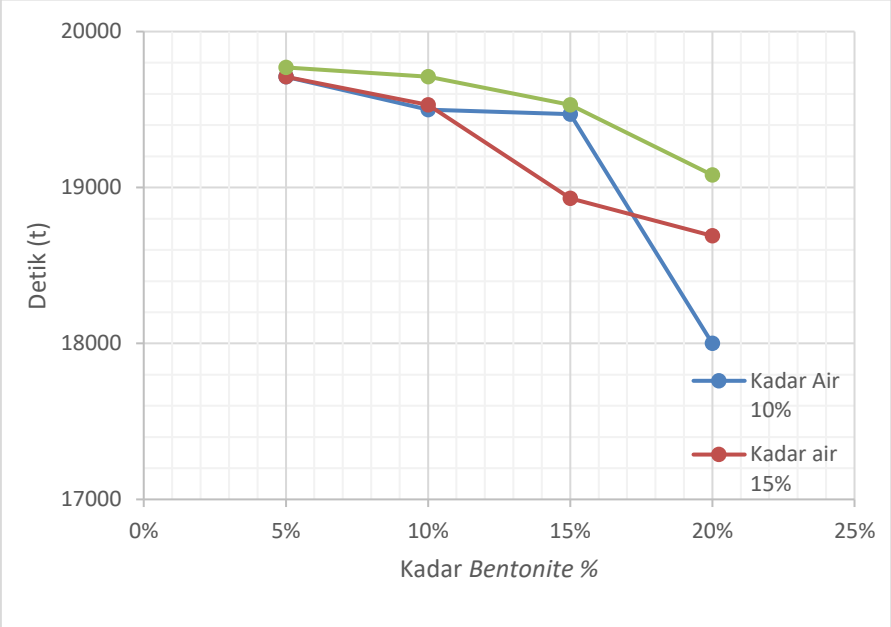

Figure 3. Graph of the Relationship of the Effect of Bentonite Percentage on Time with Mixed Samples (Bn + Water) + Cs

Figure 3. Graph of the relationship between the percentage of *bentonite* and time with the additional percentage of bentonite in the sample with a mixture of (*bentonite* + water) + *claystone* , respectively 5%, 10%, 15%, and 20%. At 10% moisture content, the time value for each additional percentage of bentonite was obtained with respective values for 19710 seconds, 19500 seconds, 19470 seconds and 18000 seconds. At 15% moisture content, the time value of each bentonite percentage was obtained with the respective values of 19710 seconds, 19530 seconds, 18930 seconds and 18690 seconds. At 20% moisture content, the time value with the percentage of bentonite was obtained with the respective values of 197770 seconds, 19710 seconds, 19530 seconds and 19080 seconds.

5.CONCLUSIONS

From the results and discussion it can be concluded as follows:

1. From the tests that have been carried out, the value of the time it takes the sample to reach equilibrium is 5 to 6 hours.
2. The addition bentonite to the sample affects the time needed to get the RH and temperature values in a state of equilibrium, the higher the bentonite content added, the faster the time obtained.

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