Identification of Geotextile Productivity in Soil Improvement Projects using Webcyclone

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Abstract. Peat soil is a type of soil having a low bearing capacity. If the ability to support the load is lower than the weight of the construction that must be borne, there will be a bearing capacity failure. Likewise, uneven compression (differential settlement) will cause structural cracking or tilted construction. Soil improvement is needed for land conditions that have low bearing capacity. The 15 MW Tanjung Selor PLTMG project is located in East Kalimantan Province with an area of 10816.51 m2 with peat soil conditions and high water level. Webcyclone is one of the web based recurring simulation programs used to analyze the productivity of a construction work. Based on the analysis of productivity by using webcyclone, the time required for soil improvement work using geotextile is 6.06 days.

1. Introduction

According to Estu Yulianto,et al (2012) that peat soil is an organic soil consisting of fibrous peat and non fibrous peat, some of the research showed that the physical properties of peat soil are low with the numbers of large pores, high moisture content and also volume weight of soil/density is small, so that the lead bearing capacity of peat soil is low.

The area of peat soil that is large enough is a constraint in the development of the infrastructure of a region. This is due to the peat soil is the soil is very soft with a bearing capacity that is very small and has easy-to-incompressible if there are loads that work on it.

If the ability of the soil to support a load smaller than the weight of the construction should be assuming there will be failure (bearing capacity failure). So also with the decline of the uneven (differential settlement) will lead to the occurrence of a cracked structure or tilting of the structure.

The work of soil improvement is needed on the condition of the land has a bearing capacity of soil is low anda also it needs to the project PLTMG Tanjung Selor 15 MW.

The Method to be used of soil improvement in the project PLTMG Tanjung Selor 15 MW is geotextile and it will be analyze based on time by using Webcyclone.

2. Theoretical framework

According to Geosindo (2012), geotextile has several properties, among others, sheets of synthetic thin, flexible, permeable used for the stabilization and improvement of the soil. Utilization of geotextile is a modern way in an effort to repair the soft soil. There are 2 types of geotextile, namely woven and non woven.

Some of the functions of geotextile are

- For soil improvement.
- For construction that have a long period of time and support large loads such as railway and retaining wall.
- As the field separator, filter, drainage and as a protective layer.
- Geotextile can be used as a reinforcement of the embankment.

Geotextile woven made of a polypropylene and having funcion as a stabilization soft ground. It have tensile strength higher than non woven about two times as much for the weight of the same per square meters. Geotextile non woven made of a polyster or a polypropylene and usually used an application of filtrasion on projets of underground drainage. (Geosindo, 2012)

(a) (b)

Figure 1. Geotextile woven (a) and non woven (b)
Source : Geosindo, 2012

According to Lyta Pratama,et al (2016), Webcyclone is one of the programs used to analyze the simulated operation of the cyclone with a web-based, the output of the Webcyclone is a value of the productivity of an operation. In calculating the productivity of the work of soil improvement by using geotextile materials and very influential on the duration of work in the field using a formula approach to calculating the duration of the work is the amount of work / productivity.

The stages in analyzing time job with Webcyclone is as follows :the identification process of the work; determine the work task, duration, and resouces; modeling flow unit diagram; manufacture of coding input; the analysis of the productivity of the work.Description of each of the components used when assembling a simulation model using Webcyclone is shown.

Name	Symbol	Function
Combination (COMBI) Activity		This element is always preceded by Queue Nodes. Before it can commence, units must be available at each of the preceding Queue Nodes. If units are available, they are combined and processed through the activity. If units are available at some but not all of the preceding Queue Nodes, these units are delayed until the condition for combination is met.
Normal Activity		This is an activity similar to the COMBI. However, units arriving at this element begin processing immediately and are not delayed.
Queue Node		This element precedes all COMBI activities and provides a location at which units are delayed pending combination. Delay statistics are measured at this element
Function Node		It is inserted into the model to perform special function such as counting, consolidation, marking, and statistic collection
Accumulator		It is used to define the number of times the system cycles
Arc		Indicates the logical structure of the model and direction of entity flow

Figure 2. Symbol of Webcyclone
Source : https://engineering.purdue.edu/, 2019

3. Research method

According to Abu Achmadi, et al (2012), research methodology derived from "method" which means an appropriate way to do something and "logos" which means science or knowledge. So, methodology is a way of doing something using mind accurately to achieve a goal. While research is an activity to find, noted, formulate and analyze until compiling the repot.

Research began with formulate problems has been formulated in the background research and then it thet reflect the steps to solve research problems. From literature review and also the collection data of primary and secondary, it can be seen data needed to do identification of geotextile productivity in soil improvement projects.

The method used in the preparation of this research is a quantitative research, i.e. research with data in the form of numbers or qualitative data that numbering. At the result and discussion, writers will summarize the results of the analysis that has been done earlier and later will be the result of this research. The research stage can be explained in the flowcharts in figure 3.

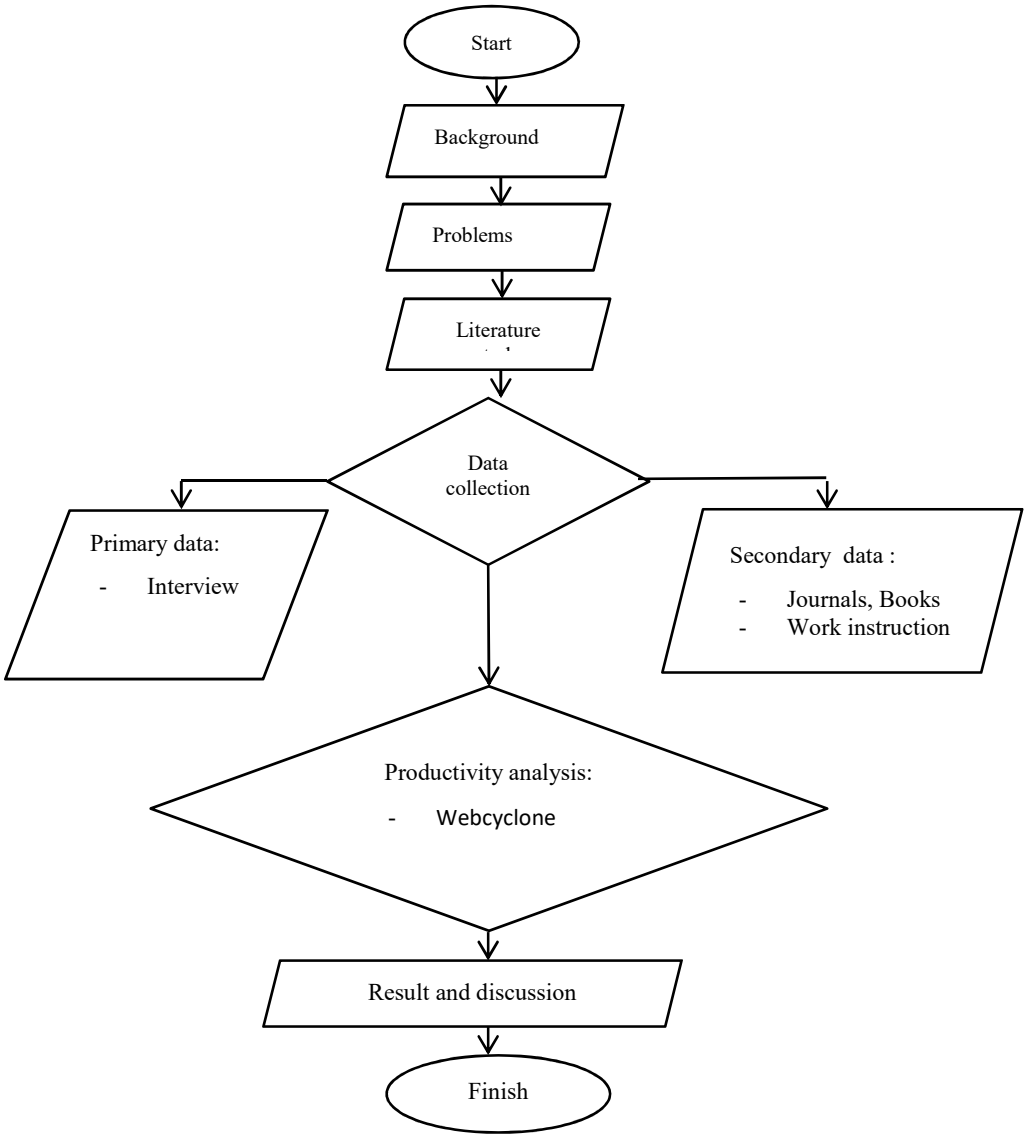

Figure 3. Flowcharts research
Source: Processed Author, 2019

4. Result and conclusion

The results of the analysis of time with Webcyclone for the work of soil improvement with the use of geotextile is as follows ;.

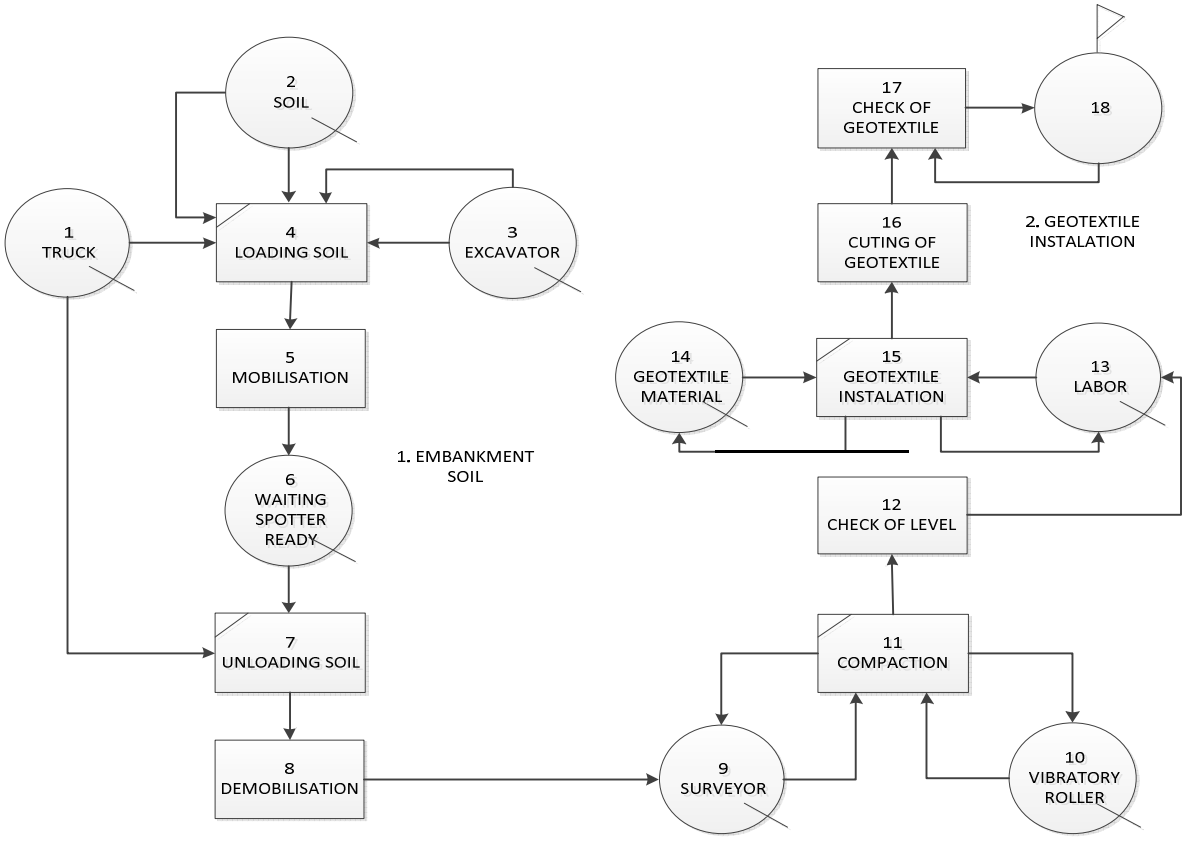

Figure 4. Flow unit diagram of geotextile
Source: Processed Author, 2019

Here is the coding for modeling Webcyclone ;
Line 1: NAME GEOTEXTILE INSTALATION PROCESS LENGTH 15.000.000 CYCLES 460
Line 2: NETWORK INPUT
Line 3: 1 QUE 'TRUCK'
Line 4: 2 QUE 'SOIL'
Line 5: 3 QUE 'EXCAVATOR'
Line 6: 4 COM 'LOADING SOIL' SET 1 PRE 1 2 3 FOL 1 2 3 5
Line 7: 5 NOR 'MOBILISATION' SET 2 FOL 6
Line 8: 6 QUE 'WAITING SPOTTER READY'
Line 9: 7 COM 'UNLOADING SOIL' SET 3 PRE 1 6 FOL 8
Line 10: 8 NOR 'DEMOBILISATION' SET 4 FOL 9
Line 11: 9 QUE 'SURVEYOR'
Line 12: 10 QUE 'VIBRATORY ROLLER'
Line 13: 11 COM 'COMPACTION' SET 5 PRE 9 10 FOL 10 12
Line 14: 12 NOR 'CHECK OF LEVEL' SET 6 FOL 13
Line 15: 13 QUE 'LABOR'
Line 16: 14 QUE 'GEOTEXTILE MATERIAL'
Line 17: 15 COM 'INSTALATION OF GEOTEXTILE' SET 7 PRE 13 14 FOL 13 14 16
Line 18: 16 NOR 'CUTING OF GEOTEXTILE' SET 8 FOL 17
Line 19: 17 NOR 'CHECK OF GEOTEXTILE INSTALATION' SET 9 FOL 18

Line 20: 18 FUN COU FOL 17 QUA 1
Line 21: DURATION INPUT
Line 22: SET 1 UNI 30 60
Line 23: SET 2 TRI 30 60 90
Line 24: SET 3 UNI 20 30
Line 25: SET 4 TRI 20 40 60
Line 26: SET 5 UNI 120 150
Line 27: SET 6 UNI 30 45
Line 28: SET 7 TRI 40 60 90
Line 29: SET 8 UNI 20 30
Line 30: SET 9 UNI 30 60
Line 31: RESOURCE INPUT
Line 32: 1 'TRUCK' AT 1
Line 33: 1 ' SOIL' AT 2
Line 34: 1 'EXCAVATOR' AT 3
Line 35: 1 'SURVEYOR' AT 9
Line 36: 1 'VIBRATORY ROLLER' AT 10
Line 37: 1 'LABOR' AT 13
Line 38: 1 'GEOTEXTILE' AT 14
Line 39: END DATA

A graph ideal from the result of running Webcyclone is a line up drastic upward, then be sloping. The form of graph mean solid activities in the early work, then slowly work to be constant. To acquire a graph ideal of the program Webcyclone have to do trial and error on the input coding cycle and length. The graph ideal at this research is presented in figure 5.

Figure 5. Chart productivity of the work of the geotextile
Source : Output Webcyclone , 2019

Based on the time analysis conducted showed the productivity for the work of the geotextile is 0.015819 units / minute.

- Work one cycle installation of geotextile 1/0.015819 = 63,22 minutes
- Processing time the installation of geotextile for 46 units = 63,22 x 46 = 2908 = 48,47 h
- The number of days required if 1 day equals 8 hours of work = 48,47 / 8 = 6,06 day

From the results of the analysis that has been done,it can be conclusion which geotextile productivity in soil improvement projects obtained execution time for a 6,06 days.

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