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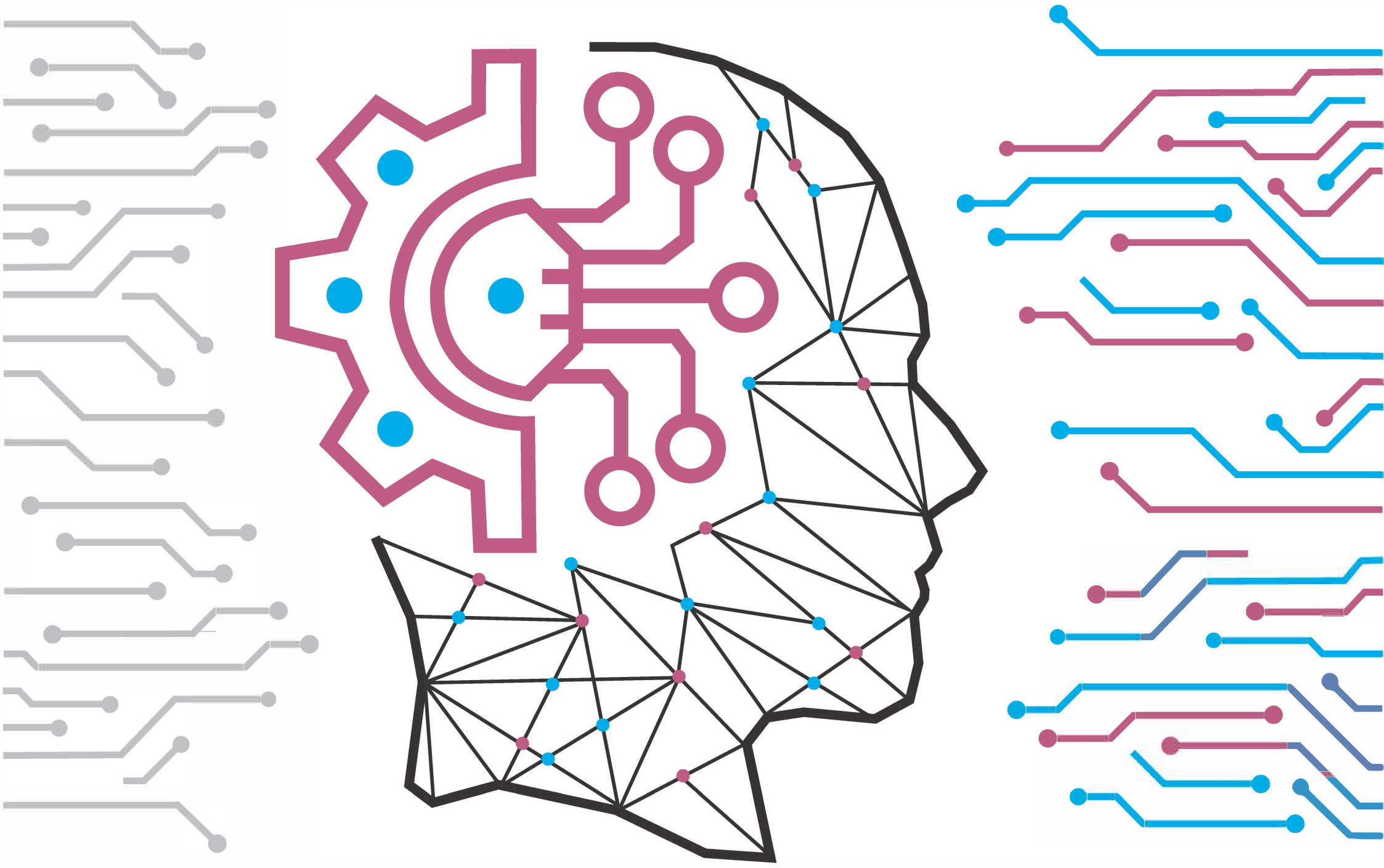

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EXTENDED ABSTRACTS

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STABILIZATION OF SOIL USING KENAF FIBRE AND EMPTY FRUIT BUNCH(EFB) IN INCREASING COMPACTION CHARACTERISTICS

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ABSTRACT

One of the most crucial and quite a huge challenge is the stabilization of the soils because it will affect long term strength and the geotechnical structures. Using waste material and natural fibre for improving soil properties is advantageous because they are cheap, locally available and eco-friendly. Currently, there are intensive studies on using Kenaf Fibre and Empty Fruit Bunch (EFB) to increase concrete strength in construction. However, there was a lack of studies on how Kenaf Fibre and EFB were used in soil stabilizing, especially in enhancing the compactness of the soil. This study aims to investigate the impact of adding the different percentages of kenaf fibre and EFB on maximum dry density (MDD) and optimum moisture content (OMC). Kenaf fibre and EFB with various percentages from 0,5,10,15 and 20% were used in this study. The optimum ratio that gives the highest value of maximum dry density (MDD) and optimum moisture content (OMC) is considered identical for stabilizing the soil.

Keyword: soil stabilization, kenaf fibre, empty fruit bunch (EFB), Optimum moisture content, Maximum dry density

1. INTRODUCTION

Soil stabilization could be a common method for most construction projects especially for problematic soil. It is vital to know the material properties of the mixture and its outcome after mixing. At the same time, the consequences of the process on the close structures and encompassing conditions have to be compelled and evaluated. Although exchanging the whole soil is not effective and efficient, soil stabilization is an efficient technique in terms of both cost-effectiveness and wealth [1]. Reinforcing the soil with kenaf fibre and EFB could be an efficient solution to soil improvement. Stabilization improves soil properties which is very important in preparing a safe foundation especially in geotechnical construction.

Kenaf fibre is a natural fibre that is obtained from the stem of the kenaf plant. Kenaf is well known as inexpensive, easily accessible locally, and environmentally better than conventional synthetic fibres generated from petroleum and has become more and more popular [2]. Kenaf fibres have the maximum carbon dioxide absorption compared to other natural fibres, and it has a low density and high modulus, and require less energy to produce [3]. When added to soil, kenaf fibre can help to reduce erosion, increase the ability of the soil to hold nutrients, and improve the overall fertility of the soil. Empty fruit bunches are one of the natural fibres that are a by-product of the refinement process of oil palm. When an empty fruit bunch is added to the residual soil, it can enhance the soil structure therefore increasing its strength. Empty fruit bunches can increase the

physical attributes of soil by improving its capacity to retain water thus enabling soil that is soft to be compressed [4].

2. METHODOLOGY

2.1 Soil Sampling

Soil samples were collected at Salak Tinggi Selangor at a depth of 1.5 m from the ground surface. Then, the samples were taken to the laboratory for several testing. The soil was washed, and oven-dried at 105°C before mixed with kenaf fibre and EFB. The percentage of 0%, 5%,10%, 15% and 20 % of kenaf fibre and EFB were used in this study.

2.2 Experimental works

All experimental tests used were according to the British Standard including Particle Size Distribution, Atterberg Limit Test, Specific Gravity and Standard Proctor Test. Soil samples with different percentages of Kenaf Fibre and EFB were tested as the results were evaluated to find the best ratio of admixture that gives the optimum value of compaction parameters.

3. FINDINGS

The summary of the result of the physical properties test is summarized in Table 1. Particle Size Distribution Test was conducted to determine the classification of the soil. From the percentage of the soil composition, the Residual soil used in this study can be classified as sandy SILT with compositions of Gravel, Silt and Clay were 35.71%, 37.23% and 11.75% accordingly.

Table 1 Physical Properties of Soil

Properties	**SS**
Depth (m)	1.5 - 2.0
Natural Moisture Content (%)	26.36
pH	5.5
Specific Gravity, (Gs)	2.56
Gravel (%)	15.31
Sand (%)	35.71
Silt (%)	37.23
Clay (%)	11.75

It can be shown that the addition of both Kenaf Fibre and EFB has a beneficial effect by improving the soil properties of the soil. From compaction test results in Table 2, it was observed that the addition of EFB mixed with kenaf had an influence on the values of MDD and OMC for the soil. From Figure 1, it can be shown that increasing the percentage of EFB from 5% resulted in a decrease in the OMC value. However, the opposite trend was observed in the MDD value, which resulted in the increase from 1.354 Mg/m^3 to 1.525 Mg/m^3 thus giving the highest strength of the soil. Therefore, the combination of EFB and Kenaf can be used as an alternative option for soil stabilization in designing a geotechnical design.

Table 2 Physical Properties of Soil with 5% of Kenaf Fibre and EFB

Properties	SS
MDD (Mg/m^3)	1.526
OMC (%)	22.22
LL	82.68
PL	56.84
PI	25.84
Classification	MV

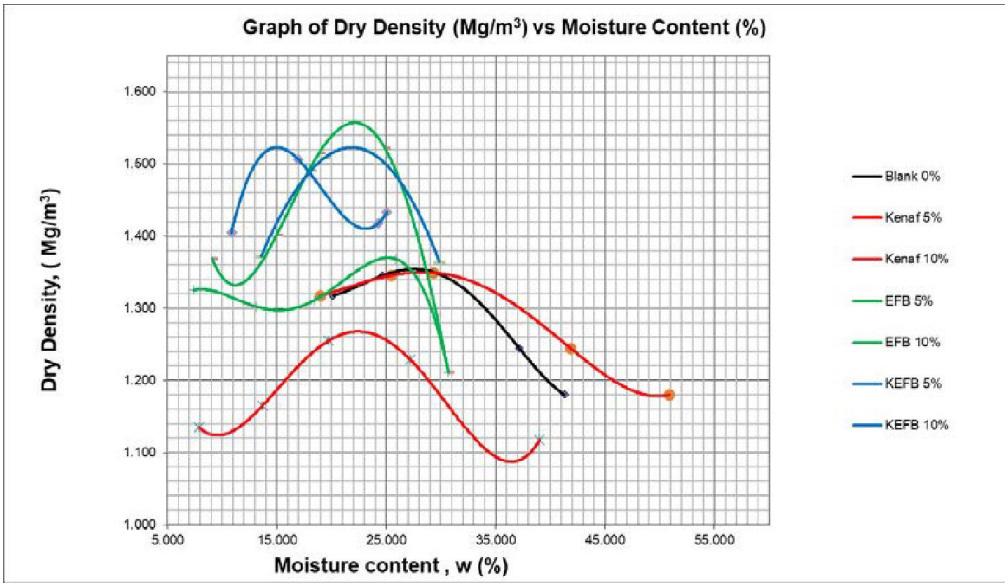

Figure 4 Combination of compaction curves of residual soil mixed with different percentages of additives

4. CONCLUSION

In summary, it can be shown that an additional 5% of Kenaf and Empty Fruit Bunch (EFB) tend to increase the Maximum Dry Density (MDD) of the soil and they can be beneficial to be used as an alternative to soil stabilizer.

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