Correlation of SPT N-Value and Equipment Drilling Parameters in Deep Soil Mixing

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Abstract : One of the most common ground improvement techniques is Deep Soil Mixing (DSM). As the technique progresses, there is still lack in the development when it comes to depth control. This was the issue experienced during the installation of DSM in one of the National projects in the Philippines. This study assesses the feasibility of using equipment drilling parameters such as hydraulic pressure, drilling speed and rotational speed in determining the Standard Penetration Test N-value of a specific soil. Hydraulic pressure and drilling speed with a constant rotational speed of 30 rpm have a positive correlation with SPT N-value for cohesive soil and sand. A linear trend was observed for cohesive soil. The correlation of SPT N-value and hydraulic pressure yielded a R^2=0.5377 while the correlation of SPT N-value and drilling speed has a R^2=0.6355. While the best fitted model for sand is polynomial trend. The correlation of SPT N-value and hydraulic pressure yielded a R^2=0.7088 while the correlation of SPT N-value and drilling speed has a R^2=0.4354. The low correlation may be attributed to the behavior of sand when the auger penetrates. Sand tends to follow the rotation of the auger rather than resisting which was observed for very loose to medium dense sand. Specific Energy and the product of hydraulic pressure and drilling speed yielded same R^2 with a positive correlation. Linear trend was observed for cohesive soil while polynomial trend for sand. Cohesive soil yielded a R^2=0.7320 which has a strong relationship. Sand also yielded a strong relationship having a coefficient of determination, R^2=0.7203. It is feasible to use hydraulic pressure and drilling speed to estimate the SPT N-value of the soil. Also, the product of hydraulic pressure and drilling speed can be a substitute to specific energy when estimating the SPT N-value of a soil. However, additional considerations are necessary to account for other influencing factors like ground water and physical and mechanical properties of soil.

Keywords : ground improvement, equipment drilling parameters, standard penetration test, deep soil mixing
Conference Title : ICSMGE 2025 : International Conference on Soil Mechanics and Geotechnical Engineering
Conference Location : Singapore, Singapore
Conference Dates : January 11-12, 2025