Discrete Element Method Analysis for Soil Deformation on the Pressure Sinkage Test

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ABSTRACT

The pressure-sinkage test used for understanding the interaction between soft soil and vehicles is modeled using the Discrete Element Method (DEM). Soil deformation at wheel-soil contacts, such as sinkage, affected by soil parameters leads to the significantly increased resistances for the driving wheel. For considering soil conditions in the wheel behavior on the soft ground, conventional wheel-soil models use characteristic soil parameters generally obtained by curve fitting to the experimental pressure-sinkage test data. However, it is not clearly understood that the relationship between soil mechanics and the characteristic soil parameter. In this study, using the pressure-sinkage model developed based on the DEM, the vertical reaction forces of the soil under the flat plate movement are obtained. The model results explain the relationship between the soil deformation under the vertical pressure and the inter-particle mechanics among the soil components. Also parametric studies on soil particle size, soil particle density, soil bulk density, Young's modulus of soil particles, inter-particle dynamic friction, and rolling friction are performed. The simulation results are verified by experimental results from an actual pressure-sinkage test with dry Jumunjin sand(coarse sand).

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