Introduction

In recent years, many research personnel have been started analysing the potential effects of the fibres when they are mixed with soils which are often regarded as low tensile and shear strength. In this paper, a DEM model is developed to simulate the behaviour of fibre-reinforced sand at both dense and loose. By simulating the fibre-reinforced sand soils and performing a series of numerical triaxial experiments, the response of stress-strain can be obtained.

Methodology

The soil and fibre model are created in the program, PFC3D. The basic principle to prepare the numerical soil sample is the particle assembly and a set of confining boundaries.

When building the fibres, a simple contact model is applied. In order to obtain the effects of fibres to the sand, the contents depending on the ratio of weight for dry sand as well as lengths of fibres has been changed.

Model Verification

- Porosity of dense (0.3) and loose (0.44) sand sample
- Stiffness of particles $1 \times 10^3 \; N/m^2$
- Confining pressure ranging from 100 kPa to 1 mPa
- Fibre contents, 0%, 0.5%, 1.0% weight of dry sand
- Fibre lengths, 2-ball and 4-ball, each ball is one-sixth of the dimension of the balls generated as soil particles

Previous experimental results

The fibre-reinforced soil has been tested in the lab, and it can be used as a certification to check and comprehensively analyse the modelling results from PFC3D.

Results

The verification mentioned before has been applied to both dense and loose pure soil as well as fibre-reinforced soil.

Conclusions

It can be seen clearly that after adding the fibres to the sand, the behaviour will be enhanced, especially for the shear strength. And with the increases in contents and lengths of fibres, the effects are more significant.

Recommendation

When carrying out the parameter study, it is found that the friction coefficient will influence the behaviour of loose sand.