

Experimental study on the biopolymer-based soil treatment (BPST) effect on the penetration resistance and load bearing capacity of pile foundations

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ABSTRACT

Deep foundations have been commonly used to increase the bearing capacity of the ground. Despite its sufficient load supporting capacity, pile foundation causes severe noise and ground vibration during in-situ installation. In this study, a biopolymer-based soil treatment (BPST) was considered to reduce the interface friction between pile structure and surrounding ground. BPST is an environmentally friendly technique that is regarded as a new ground improvement method for sustainable development. The viscosity of a biopolymer hydrogel with shear thinning rheology is dependent on the biopolymer concentration. The ground penetration resistance was assessed using a pile model capable of simultaneously measuring tip resistance and frictional force to confirm the effect of biopolymer hydrogel injection on penetration resistance reduction. Close to the end of the pile model, a pipe was connected to the outlet. When the hydrogel was injected via the pile tip, the penetration resistance force has been significantly reduced. The tip resistance decreased as the biopolymer hydrogel concentration increased, but the frictional force decreased at a similar rate.

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