

The mechanical properties of polyurethane treated soil and the application on mud pumping subgrade beds of ballastless tracks

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ABSTRACT

Polyurethane grouting could be to repair subgrade beds suffering mud pumping, but the mechanical properties of treated soil were not well studied. A set of triaxial tests was performed to examine the mechanical properties of the polyurethane treated graded crushed stone extracted from the upper layer of subgrade bed. The effects of densities, polyurethane and water contents on the strength and deformation of the treated soil were evaluated. The results indicated that the strength and stiffness of the treated soil were significantly improved, and the greater the soil density and polyurethane contents, the greater the improvement. The water contents hurt the mechanical properties. Field tests were conducted to evaluate the practicability of using polyurethane grouting to treat mud pumping subgrade beds of ballastless tracks. The defects of the mud pumping area were detected before and after grouting using the high-density surface wave method and ground penetrating radar. It was found that the shear wave velocity in the mud pumping area was significantly lower than that in the normal subgrade, and polyurethane grouting would restore it almost to the normal level. This meant that grouting was a useful method to repair mud pumping subgrade beds. In addition, the track geometry and the rail surface elevations underwent a very limited change after one year since grouting, which suggested that the treated area had good stability during the service period.

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