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Stability and Performance Analysis of a Full-Train System with Inerters

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Abstract

This paper discusses the use of inerters to improve the stability and performance of a full-train system. First, we construct a 28 degree-of-freedom train model in AutoSim, and obtain a linearised model for analysis in Matlab. Then, the benefits of inerters are investigated by the critical speed, settling time and passenger comfort. In addition, we apply a new mechatronic network for further performance improvement, and synthesise the optimal electrical circuit for experimental verification. From the results, inerters are shown to be effective in improving the stability and performance of train systems.