

The Lateral Stability of Train Suspension Systems Employing Inerters

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Abstract

This paper investigates the benefits of lateral stability of train suspension systems employing a newly developed mechanical network element known as an *inverter*. An inverter was proposed as an ideal mechanical two-port element to substitute for the mass element in the mechanical/electrical analogy. As of now, inerters have been successfully applied to car and motorcycle suspension systems, for which significant performance benefits were reported. This paper discusses the improvements on lateral stability of train suspension systems employing inerters. The study was carried out in three parts. First, an existing 12 degrees-of-freedom (DOF) train model was built and verified by a multi-body-builder, AutoSimTM. Second, inerters were applied to the train suspension system to increase the critical speed. Finally, the discussion was extended to a 16-DOF model to demonstrate the performance improvement by inerters. From the results, inerters were deemed effective in improving the lateral stability of train suspension systems.