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The development of a vehicle and road load sumulation for an engine dynamometer intended for emissons testing and powertrain development

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ABSTRACT

This dissertation documents the development and evaluation of a vehicle and road load simulation program for an engine dynamometer intended for emissions testing and power-train development. The document summarizes the reviewed vehicle emissions testing, engine testing and test equipment documentation, as part of the conducted literature study. It continues to describe the existing dynamic test cell at Cape Advanced Engineering used for the development and evaluation of the described system as well as the changes that were implemented to the test cell to enable full transient vehicle simulation. The development of an offline simulation model, a preprocessing simulation model and real time hardware in the loop simulation model are discussed. The progression made from one developed model to the next as well as the reasons for the progression are stated and discussed. The evaluation process of the hardware in the loop model as well as the conducted evaluation by the simulation of the European Communities Transient Test Cycle is discussed and the derived simulation accuracy of 7% based on fuel consumption over the duration of the test cycle is documented. Improvements made to the simulation model during the evaluation and the vehicle and power-train effective rotational inertia that was used in the model are reviewed and their effects discussed. Fields of application as well as future recommendations to the derived system are provided.