

# EFFICIENCY ANALYSIS OF OPTIMIZED HEV AGAINST CONVENTIONAL VEHICLES, IN A SRI LANKAN DRIVE CYCLE

A dissertation submitted to the  
Department of Electrical Engineering, University of Moratuwa  
In partial fulfillment of the requirements for the  
Degree of Master of Science

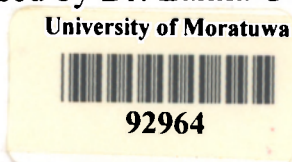


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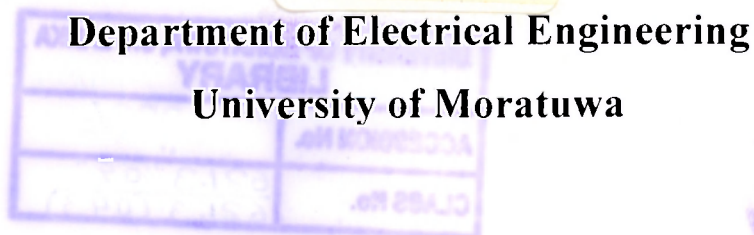
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January 2009

## DECLARATION

The work submitted in this dissertation is the result of my own investigation, except where otherwise stated.

It has not already been accepted for any degree, and is also not being concurrently submitted for any other degree.

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A handwritten signature in purple ink, appearing to read 'Lanka Udawatta'.

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## ABSTRACT

Due to the constant increase of fuel prices and environmental concerns, researchers were pushed to thinking more about fuel-efficiency and reduction of emission on vehicles. As a result there was great enthusiasm for researchers to look into and introduce hybrid technology to the field of automobiles. For example in hybrid electric power trains, an internal combustion engine (ICE) together with an electric motor (EM) is used as two energy sources. The use of an electrical motor in place of the internal combustion engine during different stages of driving resulted in a definite saving in fuel consumption.

In this study, a conventional vehicle and a HEV with varying traffic conditions & flow were compared in relation to fuel economy.

The main aspect was to compare & evaluate HEV and conventional vehicles in the Sri Lankan environment. With that in mind, developing a drive cycle in the Sri Lankan environment was essential. The Colombo drive cycle (CDC) was developed to fulfill that aspect using GPS protocol.

The HEV and conventional vehicles were simulated in following models using Colombo drive cycle.

- Parallel HEV
- Series HEV
- Conventional vehicle with CVT
- TOYOTA Prius

Simulation Models developed in MATLAB was used and to verify that QSS TB simulation model and ADVISOR simulation software was adapted.

Results showed that, with Colombo drive cycle, the two extremes come with maximum efficiency model and conventional vehicle. It proves that the optimized Parallel HEV with future data gives far better fuel economy in a real world drive cycle like CDC. Optimized HEV with prediction is so efficient in drive cycles which has so many sudden changes in acceleration, decelerating, cruse control and idle during the drive. Results were proven by comparison with simulating of above models and other available standard drive cycles. The optimized TOYOTA Prius performed far superior in the current HEV market. It's performance was excellent especially in vulnerable drive conditions.

## DEDICATION

I dedicate this dissertation to my loving parents.



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## ACKNOWLEDGEMENT

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I would be failing in my duty if I do not convey my sincere thanks to my two colleagues Mr. Sudath Wimalendra and Mr. Chaminda Edirisinghe. These two batch mates encouraged me from the very beginning to successfully complete the work to the very end.

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