**Abstract**

This dissertation examines the detailed thermodynamics models for naturally aspirated gasoline and alternative fuelled to spark ignition internal combustion engines on the basis of ideal Otto cycle. A comparative study based on the first and second laws of thermodynamics are discussed here. The key parameters for analysis are considered as mean effective pressure (MEP), power, torque, exergetic efficiency, second law efficiency, and irreversibility. Air standard assumptions were taken consideration for the analyses. MEP, power output and torque for all alternative fuelled engines, are higher compared to that of a gasoline engine. Exergy due to heat and work are also discussed here. For heat exergy, only hydrogen exceeds gasoline while other alternative fuels have lower heat exergy than gasoline. But work (mechanical) exergy for all the alternative fuelled engines are higher than the gasoline engine. The Irreversibility or losses for the alternative fuelled engines are significantly lower than a gasoline engine. Alternative fuel engines have lower specific fuel consumption than the gasoline engine. Hence the 1st law and second law efficiency of the alternative fuelled engines are higher compared to that of gasoline. This is also due to having a high compression ratio associated with alternative fuelled internal combustion engine. Exergy heat transfer of alternative fuelled internal combustion engine is higher due to having high heat generation during combustion.

**Abstrak**

Disertasi ini membuat model termodinamik untuk enjin petrol dan bahan bakar alternatif untuk enjin pembakaran dalam dengan berdasarkan kitaran ideal Otto. Perbandingan di buat berdasarkan hukum pertama dan kedua termodinamik. Kunci utama untuk analisa ini termasuklah MEP, kuasa, tork, kecekapan exergi, kecekapan tenaga hokum kedua, dan ‘irreversibility’. Analisa menggunakan andaian ‘air standard’. MEP, kuasa, dan tork untuk semua bahan bakar alternatif adalah lebih tinggi berbanding petrol. Exergi haba dan kerja juga di bincangkan di sini. Untuk exergi haba, hanya hydrogen mengatasi petrol. Tetapi untuk exergi mekanikal, semua bahan bakar alternatif adalah lebih tinggi daripada petrol. Kehilangan tenaga untuk bahan bakar alternative adalah lebih rendah berbanding petrol. Bahan bakar alternative kurang penggunaan minyak berbanding petrol. Jadi, kecekapan tenaga bahan bakar alternatif adalah lebih tinggi daripada petrol. Ini juga di sebabkan oleh nisbah mampatan yang lebih tinggi untuk bahan bakar alternatif. Exergi haba untuk bahan bakar alternative lebih tinggi kerana mempunyai penghasilan tenaga yang lebih tinggi sewaktu pembakaran.