

行政院原子能委員會
委託研究計畫研究報告

富氫機車引擎運轉控制研究
Performance Control of Motorcycle Engine
Fuelled with Hydrogen-Rich Gas

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中文摘要

世界能源短缺與環保意識的抬頭，有效利用能源及降低污染排放乃為世界各國目前極為迫切的課題。車輛的污染乃為都會區的主要空氣污染源，故能源的有效利用與污染排放的減量，乃為改善都會區空氣污染的有效方法。引擎使用潔淨能源為燃料，為現今世界的主要趨勢。由於氫氣燃料具有較快的火焰傳播速率，可在較稀混合氣下正常燃燒，若為引擎燃料添加劑，可有效降低引擎的污染排放，並改善熱效率，達到省油效果。

根據去(94)年度計畫的結果，機車引擎添加適量的富氫氣體的確可以獲得省油效果，但因為富氫氣體中除了可燃的 H_2 、 CO 外，尚有 CO_2 、 N_2 等不可燃的稀釋氣體，使得 O_2 的進氣量大為降低，而使燃燒效果變差，污染排放也因而升高，故今年將針對這些問題進行改善。此外，延續去年的計畫，今年將量測汽缸壓力，進行燃燒性能分析，以確實瞭解添加富氫氣體之後的引擎性能與燃燒特性的關係。今年計畫以丁烷為重組燃料，經過電漿轉換器重組之後的富氫氣體導入引擎為燃料，進行引擎實驗測試，測試項目包括馬力、扭力、廢氣排放特性等運轉特性、內燃機的燃料消耗及溫度等運轉特性，以瞭解引擎性能、熱效率及污染排放等特性。並量測汽缸壓力，進行燃燒分析比較。

Abstract

Improvement of fuel economy and exhaust emission has become the significant topic in the world because of the shortage of energy and the severe environmental pollution. Exhaust emissions from the vehicles are the main sources of air pollution in the urban zone. Therefore, the improvement of energy using efficiency and exhaust emission is the way to improve the air quality of the city. Thus, the clean energy used as the fuel of engines has become the worldwide trend nowadays. Hydrogen has the properties of high flame speed and wide range of lean limit. If an engine is fuelled with H₂, low emissions, higher thermal efficiency and better fuel economy could be achieved more easily than fuelled with other kinds of hydrocarbon fuels.

The better fuel economy could be obtained if the motorcycle engine fuelled with hydrogen-rich gas according to the results of last year's project. However, in the hydrogen-rich gas, except the combustible gases, H₂ and CO, it also contains dilution gases of CO₂ and N₂, which will cause the poor combustion due to the dilution of intake air. Consequently, the poor combustion will lead to severe emissions and high fuel consumption. These problems will be tackled in this project. Besides, cylinder pressure will be measured and analyzed for finding the relationship between engine performance and combustion characteristics. Hydrogen-rich gas will be reformed with butane and induced into the motorcycle engine as the fuel addition. The measured items include engine power, torque, exhaust emissions, fuel consumption and temperature. In addition, the cylinder pressure was measured and analyzed simultaneously.