

國立中興大學機械工程研究所

碩士論文

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LPG 二行程機車引擎性能量測與分析

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中文摘要

由於液化石油氣 (LPG) 燃料與現有的汽油燃料相較，具有較低污染的廢氣的排放特性，政府環保單位已配合政令，開放與宣導使用 LPG 燃料作為車用燃料，並補助一般小型營業車輛改用 LPG 燃料，以降低台灣都會區的空氣污染量。一般探討 LPG 引擎對廢氣排放與性能的影響，主要是以汽車引擎為主，本文則以機車引擎為主。本文以實驗方式，探討一般市售二行程 50 c.c. 機車引擎在改使用 LPG 燃料後對廢氣排放與性能的影響。在本文中並討論壓縮比、點火提前角、空燃比與蒸發器溫度等參數對二行程 LPG 機車引擎特性的影響。

由於目前並無 LPG 機車專用套件，在本實驗中以一汽車 LPG 套件加以改良，以配合實驗所需。由實驗結果顯示提高壓縮比可以有效增加引擎的性能；在改變點火提前角實驗結果顯示，點火提前對本實驗所用二行程機車引擎的性能提昇並無明顯的影響。在改變空燃比的引擎操作參數上，由實驗結果顯示，空燃比對於引擎性能與廢氣排放具有決定性的影響，較高的空燃比可使廢氣中的 CO 與 HC 的排放濃度降低；而過高的空燃比，使引擎的扭力輸出降低。在蒸發器溫度改變；由實驗結果顯示，蒸發器溫度對 LPG 引擎扭力輸出無明顯影響。

在本實驗結果中顯示，二行程機車引擎在改用 LPG 燃料後，HC 的排放量還是相當的高，主要的原因為二行程機車引擎的油氣短路。與原汽油引擎相較，LPG 引擎的扭力低 20%-30%，主要的原因為本實驗的週邊硬體對 LPG 燃料系統的限制所造成的影響。

ABSTRACT

As the LPG vehicles have lower emissions than the gasoline vehicles, the LPG vehicles have the potential to improve the metropolitan air pollution. In Taiwan, the pollution problem of motorbikes is more serious than that of automobiles. However, applications of LPG just are concentrated on automobiles only. The research of LPG motorbikes has not begun yet.

This is a preliminary study on the LPG motorbike engine. Two studies were conducted in this project. The first one is to study the influence of engine design parameters and the fuel system design parameters on the power and exhaust emission of LPG motorbike engines. The LPG vaporizer temperature, the air-fuel ratio, the spark ignition timing, and the compression ratio were considered in this study. In the second part of study, the performance as well as the emission characteristics were compared with those of the counterpart gasoline engine. The objective of this study is to establish the basic data of LPG vehicle emission, such that evaluations of pollution improvement can be made according to these data

Results of experiments show that increasing the compression ratio can improve the engine performance. However, the spark timing did not have significant effect on engine performance. In changing the A/F, the engine performance as well as the engine emissions were affected. As for the effect of vaporizer temperature, no conclusive results can be obtained.

Results of measured data showed that the unburned hydrocarbon is still very high for the LPG engine. This is because the unburned HC is caused by the fuel short circuit, which can not be eliminated by changing fuel to LPG. Besides, the LPG engine output torque is 20-30 % lower than that of gasoline engine. There are two reasons for the deficiency of engine torque. One is that the gaseous fuel would replace some of the volume of air such that in inlet air flow rate is reduced. The other reason is that the mixer used in this study restricted the airflow at high engine speed.

目錄

中文摘要.....	i
ABSTRACT.....	ii
目錄.....	iii
圖表目錄.....	iv
第一章 緒論.....	1
1.1 序言.....	1
1.2 文獻回顧.....	4
1.3 研究目的.....	7
第二章 LPG 燃料系統.....	8
2.1 燃料桶.....	9
2.2 蒸發器.....	9
2.3 流量控制閥.....	11
2.4 混合器.....	12
第三章 實驗設備.....	17
3.1 實驗引擎.....	18
3.2 引擎動力計.....	18
3.3 廢氣分析儀.....	19
3.4 空氣流量計.....	20
3.5 LPG 流量計.....	21
3.6 點火控制器.....	22
3.7 數據擷取系統.....	22
第四章 實驗結果.....	24
4.1 LPG 引擎基本性能數據.....	25
4-2 引擎與燃料系統操作條件的影響.....	32
4-2.1 點火提前角度的影響.....	32
4-2.2 空燃比的影響.....	35
4-2.3 蒸發室出口溫度的影響.....	38
4-2.4 汽缸頭積碳.....	39

4-3 使用 LPG 燃料引擎與汽油引擎的性能比較.....	41
4-4 LPG 引擎與汽油引擎廢氣排放的比較.....	43
第五章 結論與未來研究方向.....	102
5.1 結論.....	02
5.2 未來研究方向.....	103
參考文獻.....	104
附錄一.....	A-1
附錄二.....	A-12