

液壓混合動力汽車設計與模擬

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摘要

為了能短期內快速改善汽車業的能源消耗和汙染問題，油壓混合動力車輛(Hydraulic Hybrid Vehicle - HHV)已廣泛地引起世界各國汽車業與相關研究單位的注意，串聯式油壓混合車輛在燃料節省及汙染排放減少上具有較高的效益，但同時車體與液壓系統間元件串聯帶來控制及最佳化問題使得整體系統更為複雜，尚有許多技術需要克服。本論文蒐集液壓混合動力相關資料和背景，針對HHV整體系統的設計與開發進行深入研究，本文中將詳述HHV技術背景及發展現況、系統關鍵元件的數學模式推導，以及重要參數之決定與分析方法。利用商用軟體MATLAB下的Simulink環境和SimScape工具列建立起HHV系統模型來模擬2.5噸小貨車以評估串聯式液壓混合系統之效益，模擬系統包括內燃機引擎、縱向車體動態模型、可變量液壓幫浦/馬達，及液壓蓄壓器，在文中皆有深入的探討。透過簡單的駕駛循環評估液壓混合系統煞車動能回收成效，根據模擬結果約有超過86%的煞車動能可被儲存，重新釋放後能夠回復煞車前約72%的車體動能。伴隨著最佳化的問題，混合動力控制系統調控方法是整體系統最重要的部分，調配不同能量來源是相當困難的，本研究使用容易實現的控制策略來控制車輛運行，以模擬一個典型的駕駛循環，所提及的系統架構與模擬程式將可作為一個開發環境，提供不同的車輛應用於混合動力系統之模擬及最佳化參數設計。

關鍵詞：液壓混合動力車輛、內燃機、蓄壓器、幫浦/馬達、模擬

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