多缸四行程直接噴射共軌式柴油引擎多次噴油系統參數對汽缸燃燒壓力預測系統識別之研究

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摘 要

本研究之主旨為多缸四行程直接噴射共軌式柴油引擎多次噴油系統參數對汽缸燃燒壓力預測及性能與排放污染之研究。 藉由引擎控制之性能及噴油控制參數，輸出之燃燒壓力進行系統識別模擬分析。 系統識別之引擎響應轉移函數可用來預測多噴輸入噴油下之汽缸燃燒壓力。 研究由引擎燃燒分析儀量取相同曲軸角度對應之輸入噴油嘴之電磁閥電流訊號及輸出引擎之燃燒壓力。 實驗以單位脈衝函數輸入單次噴油訊號量取汽缸燃燒壓力取得單位脈衝響應函數後估計預測其他噴油狀態下之輸出燃燒缸壓。 由不同的系統識別法，如自動回歸模型(ARX)、自動回歸移動平均模型(ARMAX)、輸出誤差法(OE)、及BJ與等方式找到對應的預測燃燒壓力之系統轉移函數。 實驗針對直接噴射共軌式柴油引擎三種不同轉速1500 rpm、2000 rpm、2500 rpm下，對應不同負載扭力60 Nm、80 Nm、100 Nm及單噴及雙噴控制噴油上之輸入噴油電流及輸出燃燒壓力上進行系統識別。 觀察比較引擎在各種操作狀態下實驗之數據與各種系統識別，方法模擬出來之結果，驗證預測燃燒壓力模型之正確性。 使用系統識別，可以快速找出預測燃燒壓力模型之系統轉移函數，所產生的預測燃燒壓力模型可以運用於高壓共軌柴油引擎之調校， 供爾後直接噴射共軌式柴油引擎發展與調校之參考。

關鍵詞 : 高壓直噴共軌柴油引擎、噴油控制、系統識別法、預測燃燒壓力模型

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