

新及再生能源技術先期研發- 新能源產製暨儲能應用技術創新前瞻計畫

執行單位

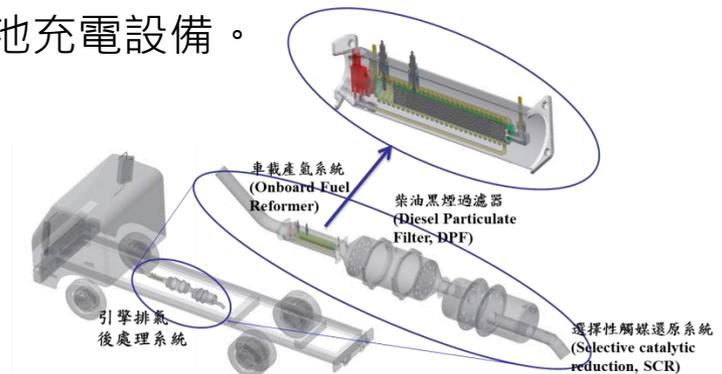
車輛研究測試中心

計畫主持人

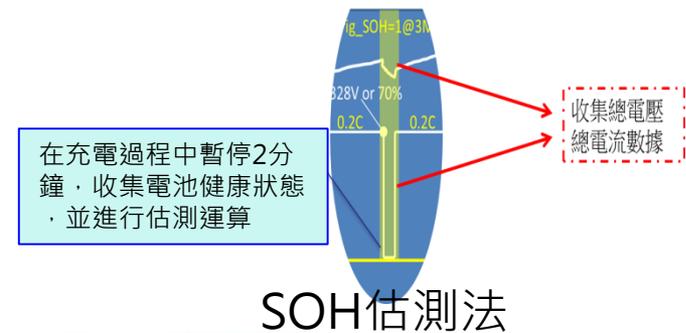
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- 本計畫以協助車輛相關產業進行具創新性及利基性之技術發展，進行「新穎性車載生質燃料廢熱重組產氫關鍵技術」及「具主動偵測與延壽控制技術儲能系統」2項技術開發。第一，可做提高柴油引擎燃燒效率或後處理系統應用，未來亦可整合燃料電池系統作為車輛輔助電力之用。第二，可協助儲能系統產業發展再生電池的應用，延壽充電策略可以應用在各種模組電池充電設備。

- 「廢熱重組產氫裝置」：利用引擎或鍋爐廢熱作為重組產氫反應熱源，進行部分氧化法燃料重組。重組後之燃料可應用於引擎、鍋爐助燃、引擎後處理系統。
- 「電池健康狀態估測裝置及方法」：針對電池充電時環境溫度影響，發展一溫度補償估算法則，可改善估測誤差。此估測技術可提供電動車電能管理系統更精準估測電池健康狀態，提高電動車運行效率及續航力。



車載生質燃料廢熱重組產氫單元



SOH估測法

● 技術介紹說明

✓ 新穎性車載生質燃料廢熱重組產氫關鍵技術:

- ✓ 完成生質燃料廢熱重組產氫裝置雛型：利用廢熱回收設計與採用多孔性介質觸媒床，利用反應室內部與外部排氣熱回饋方式來提高反應溫度，進而提高生質燃料轉化效率。
- ✓ 生質燃料廢熱重組產氫性能：在空燃比4.7下，可產出富氫合成氣體流率確達3.6m³/h、合成氣輸出功率為4kW、重組效率達72.8%與碳轉化率100%。

✓ 具主動偵測與延壽控制技術儲能系統:

- ✓ 建立電池檢視與健康偵測流程：建立汰役鋰電池檢視與偵測流程，可於2分鐘內完成可用性與健康狀態檢測。
- ✓ 建立主動健康狀態偵測技術及延壽充電方法：可於充電過程中進行充電停止動作，並分析檢測停止前後特性參數，據以進行健康狀態估算與記錄。透過量測確認再生電池的交流阻抗特性，並比對模組間的阻抗特性以進行彈性充電電流比例調控。

● 專利佈局

- ✓ 提出「廢熱重組產氫裝置」、「電池健康狀態估測裝置及方法」共6件發明專利(臺灣、大陸、美國各2件)。

● 能源效益

- ✓ 可應用至柴油引擎後處理系統、輔助引擎燃燒並擴散至固態氧化燃料電池系統，做為再生能源輔助電力單元之應用。預期可提高能源使用效率，降低污染排放，使氫能技術做為化石能源與再生能源銜接之橋樑。
- ✓ 針對國內日益增加之電動載具而造成可預見的大量廢棄鋰電池，本計畫成果可協助回收業者快速篩出可用電池與分群，另創回收處理業務獲利模式。

New and Renewable Energy Technology in Advanced Research and Development-Advance Technology Research for Production of New Energy and Application of Energy Storage

Execution Unit

Automotive Research and Testing Center

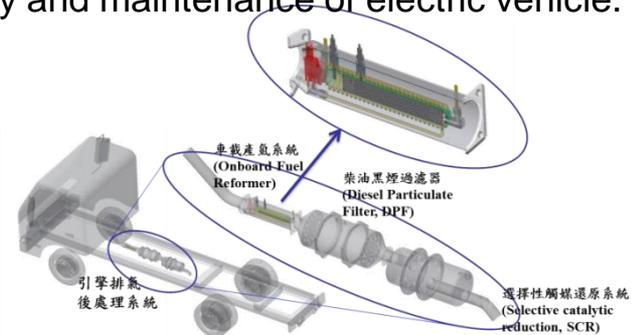
Project Director

Lin Ke-Wei

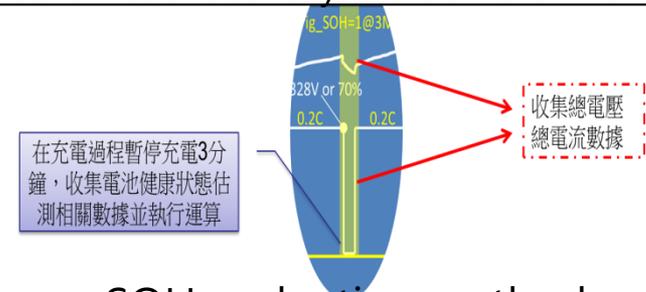
- This project included “Key technologies of onboard reformer with waste heat recovery for hydrogen production from biofuel” and “The energy storage system with active detection and life extension control technology”. The first technology could apply to improve the efficiency of diesel engine as well as aftertreatment. In the future, it also could integrate to the fuel cell system. The second technology, it could apply to energy storage system and to improve the reliability and maintenance of electric vehicle.

Patent

- “Heat recovery reforming Device” : The partial oxidation reforming utilizes the waste heat of engine or boiler to produce the syngas. It could apply to the engine ,boiler as well as fuel cell system.
- “Device and method for estimating state-of-health of battery” : A method is provided for compensating the influence of battery temperature to the SOH estimation process which improves the estimating accuracy.



On board heat recovery biofuel reformer unit



SOH evaluation method

● Introduction of technologies

- ✓ Key technology of onboard reformer with waste heat recovery for hydrogen production from biofuel
 - Prototype of onboard reformer with waste heat recovery for hydrogen production from biofuel: To increase the biofuel conversion efficiency by design of heat recovery and porous media catalyst bed.
 - Syngas production performance of reformer: Under A/F ratio is 4.7, the production of syngas can reach 4 kW and flowrate can achieve 3.6m³/h. The reforming efficiency achieved 72.8% as well as carbon conversion efficiency was 100%
- ✓ Energy storage system with active battery health detection and life extension control technology
 - Active battery health detection technology: The health of the regenerative battery can be completed within 2 minutes by a two-pulse inspection method.
 - Battery life extension control algorithm: The characteristic of the battery (ex. AC resistance) is measured and the charging current is controlled based on the information. The method could lower the battery temperature during charging and helps slowing down the decay rate.

● Patent portfolio

- There were 6 discovery patents “Heat recovery reforming Device” and “Device and method for estimating state-of-health of battery” has been applied. (Each two of Taiwan, China and The United States)

● Benefit of Energy

- The biofuel reforming technology could apply to improve the efficiency of diesel engine as well as aftertreatment. It also could integrate to the solid oxide fuel cell system as generator in the future. It can increase energy efficiency and reduce the emission. This technology can construct hydrogen technology becomes the bridge of fossil energy and renewable energy.
- It is predicted that a huge amount of Li-battery will be scrapped due to the fast-increasing number of the electric vehicles in the future. The developed technologies could be used to fast inspect and pick out the usable batteries for the energy storage system and reduce the cost up to 10%.