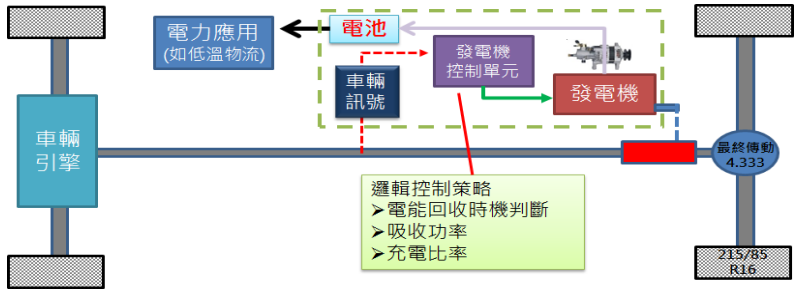
新及再生能源技術先期研發-
電動化低溫物流之儲能應用創新前瞻計畫

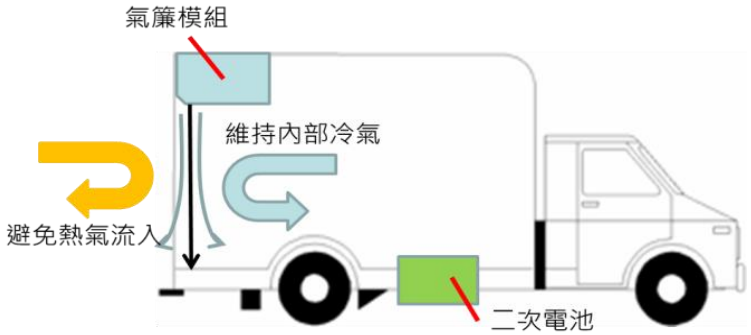
執行單位	車輛研究測試中心	計畫主持人	林博煦博士

- 本計畫所發展「動能回收與儲能技術」及「智慧氣簾及控制技術」，針對現行具電動化冷藏系統之物流車輛為目標，藉以回收車輛動能與降低貨廂開啟時的溫度變化，藉以提高電動化冷藏系統運作時間及效益。

- 「動能回充控制器、動能回充控制系統及其控制方法」專利申請：藉由「估算可回收動能」、「調節適性回充曲線」與「功率分配功能」，可依車輛上各儲能裝置狀態來分配回充能量，以最大化回收動能，進而延長電動化冷凍機組等附件系統運作時間



動能回收系統架構



氣簾模組架構

技術介紹說明

- ✓ **動能回收儲能技術**：透過匹配車輛減速、發電機效率與駕駛習性，調整當下可用之電能回收比例並使回收效率最大化，提升儲能系統續航能力
- ✓ **智慧氣簾控制技術**：依據環境條件調整風量與角度，以降低貨廂溫度變化幅度，進而減少冷凍機組耗電量

技術效益/專利佈局

- ✓ **動能回收儲能技術**：單次煞車可有效回收電量達4.13kW，延長電動冷凍機組運行時間達31%(相當於91.7分鐘)
  - 產出3件動能回充控制系統及其控制方法專利申請
- ✓ **智慧氣簾控制技術**：採用氣簾後可使貨廂內溫升速度降為3.1℃@2分鐘，可降低85.3%冷藏系統負載，並延長約38.3%之運行時間。

能源效益

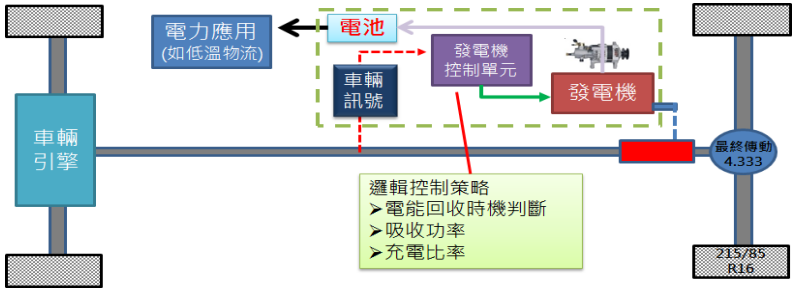
- ✓ 透過動能回收模組作動，可使電動化冷凍機組運行時間延長31%，於相同之配送狀況下可降低約1,595噸之CO_2排放；安裝智慧氣簾後可降低冷凍機組負載85.3%(約為0.176kwh)，假設每日貨箱門開啟20次且物流載具共配送兩趟次，則全台一年可降低約2,000噸的CO_2排放量

Energy Storage Technique for Electrified Low-Temperature Logistics

Execution Unit	Automotive Research and Testing Center
Project Director	Po-Hsu Lin

- The “Kinetic Energy Recovery Technology” and “Intelligent Air-Curtain System” were developed for the logistic truck with electric cooling module which were used to recover the waste energy of the vehicle and low the temperature variation during cargo door opening. The technologies could extend the operating time and increase the overall efficiency.

- Patent ” **Energy Charge Controller, Energy Charge Controlling System and Method Thereof**” : The controller is able to maximize the recover energy based on the status of the energy storage devices according to the “Kinetic Energy Estimation”, “Adaptive Recharging Curve” and “Power Distribution Method”.



Energy Recovery Technology

Air-Curtain for Logistic Truck

Technologies

- ✓ **Kinetic Energy Recovery Module and Controller:** A control strategy is used to maximize the recovered kinetic energy based on the vehicle driving condition and the driver behavior, etc., to extend the operating period of the electric cooling module
- ✓ **Intelligent Air-Curtain System**: A controller which is used to adjust the work condition of the air-curtain for preventing the cooling air leakage when cargo door is opened to decrease the power consumption of the electric cooling module

Performance

- ✓ **Kinetic Energy Recovery Module and Controller:** 4.13kW of the waste kinetic energy could be recovery during a single braking which could increase 31% of the operating time in one delivery tour
- ✓ **Intelligent Air-Curtain System**: The air curtain could decreased the temperature rising rate to 3.1℃ in 2 minutes which could lower 85.3% of the cooling load and increase 38.3% of the operating time in one delivery tour

Energy Efficiency Improvement

- ✓ The developed technologies could lower 1,595 tons and 2000 tons of CO2 emission respectively annually for the logistic vehicles which is very helpful for easing the greenhouse effect.