中小型低溫廢熱有機朗肯循環應用於產業節能減碳之整合型技術開發(1/2)

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有機朗肯循環(ORC)產業可整合國內本土的技術，建立在低溫熱源(如90℃-150℃)下進行廢熱回收之商業化發電模組，本計畫所研發的3kW與10kW動力輸出的ORC機組與技術，可全面適用於中、小企業產生的廢熱，協助產業達成節能減碳。

專利申請：渦卷膨脹器之改良設計與開發
目前全世界ORC商用機組，在膨脹器的選擇上是採用渦輪機或是螺桿膨脹器。本研究採用渦卷式膨脹器，其不同於其他膨脹器設計之處在於，此型膨脹器適用於中小型ORC發電機組，且適合於許多中小企業所產生的廢熱量。

開放式渦卷膨脹器之開發成品

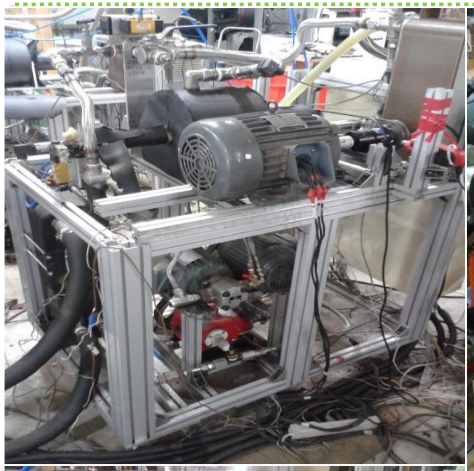
有機朗肯循環(ORC)是以常壓下低沸點之有機流體做為工作流體，在廢熱回收上之應用具有相當大的應用潛力。本計畫主要針對150℃以下廢熱回收之3kW與10kW動力輸出的ORC 發電模組進行開發。3kW ORC機組以穩定、安全、持續性運轉為目標進行精進，且根據不同操作條件，如不同廢熱量、改變廢熱源流量等進行實驗分析。結果顯示操作之熱源範圍為15.8 kW至42.4 kW，其最佳淨熱電轉換效率為3.91%，產生2.1 kW的發電量。10kW ORC機組今年度計畫進度已超前，初步的實驗成果顯示在操作之熱源範圍為53 kW至113 kW下，最佳淨熱電效率為4.59%，最大發電量為6.32 kW，這些寶貴的實驗數據已發表了數篇國際知名的期刊並刊登，且受到國際的重視。雖然系統效率不高，但本研究已掌握了關鍵技術，並將精進開發為商業化產品。

The integrated development of small-to-medium sized organic Rankine cycles in converting low-temperature waste heat for industrial energy saving and carbon reduction

Execution Unit	National Taipei University of Technology
Project Director	Tzu-Chen Hung

Organic Rankine Cycle (ORC) can integrate the domestic technology in establishing the commercial power systems for waste heat recovery from the heat source lower than 150℃. The capacity of 3kW and 10kW units developed by us can be fully applicable on waste heat from small and medium-sized industries and assist them to achieve energy saving and carbon reduction.

Patent application: the design and development of scroll-type expander
At present, most of the users use the types of turbine or screw as the expander for ORCs. Our invention focuses on the scroll-type expander, that is different from other commercial products. Scroll-type expander is quite suitable for small and medium-scale ORC power generation systems.



開放式渦卷膨脹器之開發成品

Organic Rankine cycle uses low-boiling temperature organic fluids as working fluid. It is potentially applied for waste heat recovery. In the present stage, the development of 3kW and 10kW of ORC power generation systems has been completed for industrial waste heat lower than 150℃. The development objective of 3kW ORC emphasizes on its stability, safety and persistence. It has been analyzed and operated by some parameters, such as the quantity of waste heat input, various flow rate of heat sources, and so on. The results have shown that the best net electrical efficiency and electrical power output are 3.91% and 2.1 kW, respectively. This 3kW ORC operated between 15.8 kW and 43.4 kW of heat input. Besides, we have been ahead of schedule for the setup and testing of 10kW ORC. The best net electrical efficiency and electrical power output are 4.59% and 6.32 kW, respectively. It was operated between 53 kW and 113 kW of heat input. These experimental data have been published in well-known international journals and have been well recognized internationally. Although the efficiency is not high as expected, some key technologies are held for improving and advance in the development of the commercial products.