

行政院原子能委員會
委託研究計畫研究報告

(廢棄物發電系統高溫燃器淨化技術研發)

(Development of Moving Granular Bed Filters for High-Temperature
Flue Gas Cleanup in the Biomass Power Generation System)

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受委託機關(構)：國立中央大學機械系

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中文摘要

近年來歐美日大力發展廢棄物氣化發電系統與先進燃煤發電系統，這些系統均會產生高溫高壓之氣體，在進入氣渦輪機前必須有效除塵，方能使系統有效運作。以顆粒床過濾器淨化高溫氣體一直存在著濾材靜止區形成，而造成系統堵塞之問題。過去幾年研究，我們已經發展了顆粒床內置入雙葉片系列之流動校正單元，可有效解決此問題。

本年度計畫將以二維雙葉片系統配置實驗最佳結果，設計並製作三維冷性能測試模型，加裝廢氣煙塵產生裝置，觀察染塵濾材之流動形態，並進行實際冷性能測試。冷性能測試項目以過濾床之實際過濾效率與廢氣穿透過濾床的壓力降隨時間變化為主，濾材循環流率、進風口風速與廢氣所堆積的濾餅都是影響因素。依據冷性能測試結果，除了搭配濾餅的效果來尋出最佳過濾效率外，再配合穩定的壓降與粒徑分析結果，提供設計實際雛形之依據，並於未來規劃三維熱模系統，以期能實際與產業界結合。

關鍵詞：流動式顆粒床、雙葉片流動校正單元、高溫氣體過濾、冷性能測試、過濾效率

Abstract

The biomass gasification system for power generation and the advanced coal-fired power plants have been developed in United States, Europe and Japan in recent years. High temperature gases are generated during the gasification of the biomass or the coal. The high temperature gases contain many dust particulates and fly ashes that should be filtrated before entering gas turbine. The moving granular bed used for filtration of the hot gas is one important apparatus under development. When the filter granules move downwards through the vertical channel, they may stop between two louvers and form a stagnation zone. The dust particulates are attached to the filter granules when the hot gas enters the filter. Therefore, the hot gas entrance may be plugged eventually and the filter efficiency would decrease remarkably. Putting a series of flow corrective elements has been proven to be a good solution to removing the stagnant zones and has been patented by our research group. However there still remain some systematic problems. This project tries to develop a sub-louvered system of moving granular bed to get even better results.

In the first year project, we have found the optimum arrangement of the louvers and the sub-louvers. The stagnant zone of filter media is totally diminished in this system. A three dimensional cold model of a moving granular bed filter will be constructed in this project to perform the related cold tests. A dust generator will be connected to the apparatus in order to generator the dust gases. The cold tests include the filtration efficiency and the moving bed pressure drop measurements. The filter granular circulation rate, the inlet gas velocity and the dust cake are important factors influencing the filtration efficiency. The cold test

results give important information for designing the prototype of the moving granular bed filters.

Key words : moving granular bed, sub-louver flow corrective element, high-temperature gas cleanup, cold test, filtration efficiency.