Sample Translation

Mechanical Engineering

- See below for the original Chinese manuscript.
- **A native-speaker of English who has studied engineering** proofreads the translated English.
- The quality of the translated manuscript is suitable for publication in an international journal.

Power Plant Thermal Efficiency Analysis Model

1. Foreword

Conventional thermal power plants can be classified by their thermal power circulation medium. , For example, those whose circulating fluid involves phase changes between steam and cooling water are called Rankin cycle power plants, or conventional steam cycle power plants. Those using air circulation are called Brayton cycle power plants. Most base-load power plants in Taiwan currently use steam turbines to run the Rankin cycle for continual long term operation, while the peak-load power plants use air turbines that use air as a circulating fluid to run the Brayton cycle. The latest power plants use both cycles, called combined cycle plants, which have advantages in achieving improved thermal efficiency.

One of the advantages of steam cycle thermal power plants is that there are various heat sources available for thermal power generation, such as fossil fuel, nuclear fission reaction, and solar energy. Figure 1 shows the schematic of a typical steam cycle power plant, where fuel is burnt in the boiler to heat the circulating fluid (liquid water) to generate high pressure steam to turn the turbine blades, rotate the turbine and thus drive the power generator. The electricity produced is fed into the power system via a dispatching network. A steam turbine system usually consists of a series of high, medium, and low pressure steam turbines so that the steam can be recycled and the majority of the steam energy is utilized, thereby increasing overall thermal efficiency. The low pressure steam exiting from the turbine is passing through a condenser and condensed into liquid water for recycling. The cooling water in the condenser could potentially be sourced from the sea, a river or a lake, so that the waste heat is removed using

natural water bodies. Alternatively, the condenser could be air cooled, where the waste heat is removed into ambient air, so that heat pollution is minimized. The exhaust air from the boiler, is then treated by various scrubbing operations such as SCR, ESP, FGD to remove pollutants including oxides of sulfur, oxides of nitrogen, carbon dioxide, suspension particles, etc, prior to releasing the exhaust air to the atmosphere.

發電廠能源系統熱效率模式分析

1.前言

傳統火力電廠可用熱功循環種類予以區分。若工作流體以蒸汽及冷凝水交替變相工作者，稱為郎肯(Rankin)循環電廠，俗稱蒸汽循環，另以單一熱氣體作功者稱為布雷登(Brayton)循環電廠。我國多數的基載電廠利用以蒸汽為工作流體之汽力機進行郎肯循環，在長期連續的模式下操作；尖載電廠則利用以熱氣體為工作流體之氣渦輪機進行布雷登循環，在尖峰負載時段操作。現代較新的發電廠將上述兩種循環合併運用，稱為複循環電廠，可得較高之能源轉換效率。

蒸汽循環火力電廠的優點之一，是可以各種熱源進行熱功轉換而發電，例如化石燃料、核分裂反應、聚焦陽光等。圖 1 為典型蒸汽循環火力電廠的設施架構圖，其中燃料於鍋爐內燃燒，加熱工作流體(液態水)後產生高壓蒸汽，推動汽輪機葉片使之旋轉，同時帶動同軸發電機發電，電能經由輸電網路饋入電力系統。汽輪機一般採用高壓、中壓與低壓三段串接式架構，將蒸汽重複應用，以提取最多的蒸汽熱能發電，增加機組之能源轉換效率；低壓汽輪機排出之低壓蒸汽經過冷凝器凝結成液態水後，再由幫浦饋入鍋爐循環再用。冷凝器之冷卻水可由海水、河流或湖泊等提供，將蒸汽廢熱排入自然水體；冷凝器亦可用冷卻塔以風冷方式進行，將廢熱排入大氣，可減少環境熱污染問題。鍋爐廢氣中大量的硫氧化物、氮氧化物、二氧化碳、懸浮微粒等環境有害物質，經過靜電集塵與各種脫硫、脫硝設備處理後，再由煙囪排入大氣中。