

Thesis Title	Performance Evaluation and Optimization of Fluidized Bed Cogeneration Plant
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Abstract

This paper describes the performance, heat transfer and optimized condition of the fluidized bed boiler in the bio-mass electric power station of the TPS company. Performance of the boiler is calculated by its thermal efficiency, heat loss, heat transfer rate and heat transfer coefficient in the boiler based on high heating value. It is found that the thermal efficiency of the boiler is 77% and the main loss about 9.13% is from water vapor in the fuel.

The furnace water wall area the heat transfer rate is 54.9% of the total heat transfer rate and the total heat transfer coefficient is $53.3 \text{ W/m}^2\text{K}$. At the superheater the heat transfer rate is 19.5% and the total heat transfer coefficient is $47 \text{ W/m}^2\text{K}$. The economizer 3, the heat transfer rate is 4.47% of the total heat transfer rate and the total heat transfer coefficient is $50.4 \text{ W/m}^2\text{K}$. The heat transfer rate is total heat transfer coefficient of hot water feeding to economizers 1 and 2 are 21.13% and $28.8 \text{ W/m}^2\text{K}$, respectively.

Optimization of the 40 kg/s steam boiler for three conditions of the rice husk fuel are considered. The normal rich husk supply condition gives the lowest price 4.08 baht/s with the fuel ratio of the rice husk 79.86% and bark 20.14% by weight, the feed of fuel and combustion air are, respectively, 10.88 kg/s and 48.2 kg/s with the oxygen in the exhaust of 2.5% by volume. The less rice husk supply condition gives the lowest price of 3.78 baht/s with the fuel ratio of rice husk 58.6% and bark 41.4% by weight, the feed of fuel and combustion air are, respectively, 12.51 kg/s

and 49.88 kg/s with the oxygen in the exhaust air of 2.5% by volume. The lack rice husk supply condition gives the lowest price 4.82 baht/s with the fuel ratio of rice 56.04% bark 32.97% and chip 10.99% by weight, and the feed of fuel and combustion air are respectively, 12.28 kg/s and 49.59 kg/s with oxygen in the exhaust 2.5% by volume. The fuel ratio using high bark is preferred because of its lowest cost compared with the others. It should be, however, aware of bed agglomeration due to chemical reaction of its ash.

Keywords: boiler/fluidized bed/bio-mass/heat transfer rate/heat transfer coefficient.