Modeling and Benchmarking the Thermal Energy Performance of Palm Oil Production Plant

Authors : Mathias B. Michael, Esther T. Akinlabi, Tien-Chien Jen

Abstract : Thermal energy consumption in palm oil production plant comprises mainly of steam, hot water and hot air. In most efficient plants, hot water and air are generated from the steam supply system. Research has shown that thermal energy utilize in palm oil production plants is about 70 percent of the total energy consumption of the plant. In order to manage the plants' energy efficiently, the energy systems are modelled and optimized. This paper aimed to present the model of steam supply systems of a typical palm oil production plant in Ghana. The models include exergy and energy models of steam boiler, steam turbine and the palm oil mill. The paper further simulates the virtual plant model to obtain the thermal energy performance of the plant under study. The simulation results show that, under normal operating condition, the boiler energy performance is considerably below the expected level as a result of several factors including intermittent biomass fuel supply, significant moisture content of the biomass fuel and significant heat losses. The total thermal energy performance of the virtual plant is set as a baseline. The study finally recommends number of energy efficiency measures to improve the plant's energy performance.

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