ABSTRAK

Penelitian ini menganalisis kehilangan panas (heat loss) dan efisiensi energi pada sistem ducting yang mentransfer udara panas dari unit heater menuju unit dryer pada pabrik karet PT. London Sumatera Tbk. Unit heater yang digunakan adalah Blaze 125 (tahun 2007) dengan bahan bakar palm shell, sedangkan ducting terbuat dari baja karbon berdiameter dalam 0,798 m, panjang 18,7 m, serta dilapisi isolasi glasswool setebal ±2 cm dengan plat aluminium sebagai pelindung. Suhu udara masuk ke ducting sebesar 150 °C, suhu lingkungan 30 °C, sedangkan suhu udara keluar menuju dryer sebesar 120 °C dengan kecepatan aliran 13,94 m/s.Hasil analisis menunjukkan bahwa terjadi kehilangan panas melalui mekanisme konduksi pada dinding baja karbon, konduksi pada lapisan isolasi glasswool, serta konveksi dan radiasi dari permukaan aluminium ke lingkungan. Total kehilangan panas yang terhitung mencapai ±12–15% dari total energi panas yang dihasilkan heater. Berdasarkan kondisi operasi, efisiensi perpindahan energi dari heater ke dryer berkisar antara 85–88%. Temperatur permukaan luar ducting (plat aluminium) yang terukur sebesar 64 °C menunjukkan bahwa isolasi glasswool masih berfungsi, tetapi belum optimal dalam menekan kehilangan panas.Rekomendasi teknis yang diajukan meliputi peningkatan ketebalan isolasi hingga 40 mm atau penggantian material isolasi dengan konduktivitas termal lebih rendah (misalnya polyurethane atau PIR), serta optimalisasi desain jalur ducting. Dengan perbaikan tersebut, potensi peningkatan efisiensi energi sistem dapat mencapai lebih dari 90%, sekaligus menurunkan biaya bahan bakar dan meningkatkan kualitas proses pengeringan karet

Kata kunci : Heat loss, efisiensi energi, ducting, isolasi termal, glasswool, pabrik karet, pengeringan.

ABSTRACT

This study analyzes heat loss and energy efficiency in the ducting system used to transfer hot air from the heater unit to the dryer unit at PT. London Sumatera Tbk rubber factory. The heater employed is a Blaze 125 (2007) fueled by palm shell, while the ducting is made of carbon steel with an inner diameter of 0.798 m, a length of 18.7 m, and covered with approximately 2 cm of glasswool insulation and an aluminum plate as the outer layer. The inlet hot air temperature is 150 °C, the ambient temperature is 30 °C, and the outlet air temperature at the dryer is 120 °C with a flow velocity of 13.94 m/s.The analysis results indicate that heat loss occurs through conduction across the carbon steel wall, conduction through the glasswool insulation, and convection–radiation from the aluminum surface to the surrounding environment. The total heat loss was estimated at approximately 12–15% of the total thermal energy generated by the heater. Under current operating conditions, the energy transfer efficiency from the heater to the dryer ranges between 85–88%. The measured outer surface temperature of the ducting (aluminum plate) at 64 °C suggests that the glasswool insulation still functions but is not fully effective in minimizing heat dissipation. Technical recommendations include increasing the insulation thickness up to 40 mm or replacing it with a lower thermal conductivity material such as polyurethane or PIR, as well as optimizing the ducting layout. With these improvements, the overall system efficiency has the potential to exceed 90%, thereby reducing fuel consumption and improving the quality of the rubber drying process.

Keywords :*Heat loss, energy efficiency, ducting system, thermal insulation, glasswool, rubber factory, drying process*