

Stack effect on power consumption of refrigerated containers in storage yards

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Abstrak

This paper investigates the stack effect on the power consumption of refrigerated containers. The investigation is based on measurement experimentation that was conducted in Hakata Island City Container Terminal, Fukuoka, Japan. Experimentation was carried out over summer 2015, using three stacks of high cube refrigerated containers. Several sensors and devices were employed to ascertain parameters, including pyranometers, thermocouples, and power analyzers. Five units of pyranometers were set on a horizontal and vertical plane, facing all cardinal directions. Thermocouples were installed inside and outside of walls at a total of twenty points. Power meters employed to measure energy consumption were set on the power plug station nearby the measurement object. Measurement results showed that the stacking position of refrigerated containers affects the distribution of surface temperatures and power consumption. The average surface temperatures obtained on the top tier, middle tier, and bottom tier were 45°C, 41°C and 38°C at noon, respectively. Consequently, the average power consumption from the top tier, middle tier, and bottom tier were shown as 7.7 kW, 7.4 kW and 7.5 kW, respectively. From these results it can be concluded that the stacking effect of containers provides thermal benefit to the power consumption of refrigerated containers that are located on the middle tier and bottom tier.