

## 8. Development of Automated Air Curtain System - Study on the Effect of Airflow Direction on Thermal Shielding Performance of Air Curtain -

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One method for separating indoor and outdoor thermal environments is the use of air curtains. Appropriate adjustment of the air outlet angle of the air curtain can improve thermal insulation performance; however, knowledge on this subject remains limited. We used Computational Fluid Dynamics (CFD) analysis and empirical experiments and confirmed that adjusting the air outlet angle towards the warmer area increases thermal insulation performance by roughly 10%. Additionally, we developed a mechanism to automatically control the air outlet angle of the air curtain based on the difference between indoor and outdoor temperatures. By using this automatic control, we were able to reduce air conditioning energy consumption by roughly 8% over a 30-minute period compared to when the air curtain was not in operation.

**Keywords:** air curtain, sealing efficiency, computational fluid dynamics,  
thermal insulation performance