Influence of Seesaw Permanent Movement of a Person on the Performance of an Air Curtain Device

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Summary: *In commercial and industrial activities, there is often a need for reducing or controlling heat and mass transfer between outside environment and indoor compartments with controlled atmosphere, warranting, simultaneously, an easy circulation of people and equipments. In practical terms, the confinement of a given space can be achieved with aerodynamic barriers (air curtains) constituted by one or more air jets. In the present paper, the loss of efficiency of a vertical downward air curtain due to the seesaw permanent movement of a person is analyzed. Results show a systematic loss of the sealing efficiency (10 to 20%) of the air curtain device when the doorway is periodically crossed by a computer controlled manikin "Roberta" relatively to the results obtained without this traversing movement.*

Keywords: *thermal confinement, air curtain, sealing efficiency*

1 Introduction

In commercial and industrial activities, there is often a need for reducing or controlling heat and mass transfer between outside environment and indoor compartments with controlled atmosphere – where environmental parameters (air temperature, relative humidity, pollutants concentrations, etc.) should be kept within limits compatible with human presence – warranting, simultaneously, an easy circulation of people and equipments. In practical terms, the thermal confinement of a given space can be achieved with aerodynamic barriers – usually named air curtains devices (ACD) – constituted by one or more air jets [1, 2].

In the present paper, the loss of efficiency of a vertical downward air curtain due to the seesaw permanent movement of a person is analyzed. The air curtain device was mounted over a doorway, in the wall between two equal contiguous rooms at different temperatures, simulating a situation where there is the intention of isolating a comfortable room from a warmer outside environment. A computer controlled transport mechanism was used to ensure the traversing seesaw movement of a manikin – named "Roberta" – through the doorway. The sealing efficiency provided by the air curtain for various cases (different initial velocities of air curtain jet and different velocities and frequencies for manikin movement) was determined through the tracer gas technique [3]. Results show a systematic loss of the sealing efficiency (10 to 20%) of the air curtain device when the doorway is periodically crossed by a person relatively to the results obtained without the simulation of the traversing person movement [4, 5, 6].

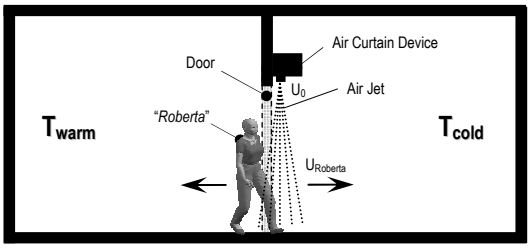

Fig. 1 – Experimental facility representation.

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