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## **AUTOMATIC CONTROL OF A ROOM VENTILATION SYSTEM BY A SINGLE FAN ACTUATOR**

### **Abstract:**

Ventilation with a combination of active aeration fans and passive openings is essential for keeping rooms in houses comfortable. However, excessive use of an exhaust fan may prevent doors from being opened because of decreasing pressure in the room. In addition, when the room pressure is too low, the aeration fans are not always able to ventilate the air. In this study, we present a simple feedback system to address these house ventilation problems. The proposed system uses a ventilation fan as an actuator and a highly sensitive sensor for feedback.

The ventilation fan in the proposed system rests in standstill mode without any electric power supply. The fan starts rotating when the pressure difference between the inside and outside of the fan exceeds a specific value, and the basket-type induction motor generates AC voltage. In this case, the induction motor is used as a sensor to provide a low power signal. Because of the self-sensing mechanism, the fan works well for a certain period. Subsequently, it returns to the standstill mode and continues to monitor the pressure difference.

We conducted experiments in a kitchen to test the theory. The kitchen had an exhaust fan with an airflow of 800 m<sup>3</sup>/h installed in the range hood. At the maximum exhaust setting, the room pressure decreased to -9.0 Pa. We fixed a ventilation fan with an airflow of 80 m<sup>3</sup>/h as the control ventilation fan. The room pressure was monitored using the induction motor. According to the specifications of the motor, a voltage more than 0.12 V implies that the pressure is below 3.0 Pa. In this case, the AC power supply was switched on by the circuit and aeration was performed for 10 seconds. After aeration, the fan entered standstill mode, and monitoring started. The results indicate that the proposed ventilation system worked well to increase the room pressure from -3.0 Pa to -1.2 or -1.5 Pa. Under non-aeration, the room pressure remained constant at -3.0 Pa.

In summary, a self-sensor-based automatic aeration control ventilation system was proposed. The aeration fan itself was able to measure the subtle pressure decreases in the room, and we believe that such a system could eliminate the need for manual switching of aeration fans.

**Keywords:**

Automatic Control

Ventilation

Self-sensing

Monitoring

aeration

Pressure

**JEL Classification:** C67