

## Experimental Study of a Cooling Coil and the Validation of its Simulation Model for the Purpose of Commissioning

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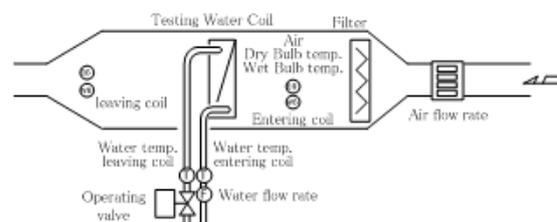
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**Abstract:** For HVAC system commissioning, it is important to evaluate the performance of the cooling coil in an air-handling unit. However, manual evaluation requires a great deal of time and effort. One solution is to predict the coil performance by simulation. However, it remains unclear whether the currently available simulation models can provide accurate results under various operational conditions. In the present study, a slit fin type coil was investigated by conducting two series of experiments, for the VAV system and the CAV system, respectively. In addition, the accuracy of seven simulation models was examined using the experimental data.

### 1. INTRODUCTION

For HVAC system commissioning, it is important to evaluate the performance of the cooling coil in an Air-Handling Unit (AHU). However, manual evaluation requires a great deal of time and effort. One solution is to predict the coil performance by simulation. However, it remains unclear whether the currently available simulation models can provide accurate results under various operational conditions. In order to verify the appropriateness of using the estimation value obtained by the simulation for commissioning, it is important to validate the accuracy of the model under various operational conditions. In the present study, a slit fin type coil, which is used in most AHUs, was investigated by conducting two series of experiments, for the Variable Air Volume (VAV) system and Constant Air Volume (CAV) system, respectively. In the VAV system experiments, the exchanged heat and outlet water temperatures were measured under the conditions of changing the set point of the outlet air temperature and the air flow rate. In the CAV system

experiments, the exchanged heat and outlet water temperatures were measured under a constant air flow rate and gradual variation of the water flow rate. In addition, the accuracy of seven simulation models was examined using the experimental data.



**Fig. 1** Schematic diagram of the experimental

### 2. EXPERIMENT

#### 2.1 Outline of the Experiment

In the present study, two series of experiments were conducted to examine the Variable Air Volume (VAV) system and the Constant Air Volume (CAV) system, respectively. In these experiments, the air/water outlet value was measured under the stable condition of maintaining constant the air/water inlet value. The specifications of the coil used in the experiment are shown in Table 1, and a schematic diagram of the experimental apparatus is shown in Figure 1.

**Tab. 1** The specification of coil for the experime