

RESEARCH BRIEF

2003/003

Developing an Energy Efficient Air-conditioning System with Zonal Ventilation Control for Improved Indoor Air Quality

INTRODUCTION

Air-conditioning in tropical climates is dictated by the stringent requirements of cooling and dehumidification, which becomes a challenge to the designer who is usually confronted with cost-effective design criteria to address thermal comfort, indoor air quality (IAQ) and energy issues. The fundamental objective is therefore to provide an air-conditioning system with superior indoor environmental performance that is achieved in an energy-efficient manner.

OBJECTIVES

1. Development of a new energy efficient method and means of air-conditioning for an independent control of temperature and humidity of two different air streams.
2. Development of an improved method of air distribution for an independent control of ventilation air quantity at acceptable temperature and humidity conditions in congruence with the overall environmental conditions in the indoor space so that the desired set-point conditions in the occupied space are achieved at all times of operation.

A new method of air-conditioning and air distribution has been developed that is both energy efficient and maintains good indoor air quality (IAQ). The Single Coil Twin Fan (SCTF) air-conditioning system consisting of a compartmented coil and the SCTF air distribution system are the subject of two US and PCT patent applications (filed in November 2002).

MAJOR FINDINGS

- The newly developed SCTF system with the compartmented coil conditions distributes air through the multiple zones of an air-conditioned building such that adequate ventilation, and consequently, acceptable IAQ is ensured throughout the operating range of the air-conditioning system.
- The compartmented coil of the SCTF system has shown an energy saving potential of 12%.



The Single Coil Twin Fan (SCTF) air-conditioning and air distribution system.

- A basis is provided for an integrated design of the cooling and dehumidifying coil that derives the optimal energy efficiency of the coil while achieving the desired cooling and dehumidifying performance and is envisaged to be of immense benefit in maintaining good indoor air quality in tropical buildings.

Some findings from this research project were presented as two papers at HB 2003¹, attended by about 400 delegates from almost 30 countries. The SCTF concept and a comprehensive set of findings will be presented at the ASHRAE² Annual Meeting in Nashville, USA, in June 2004 and will subsequently be published in the peer-reviewed *ASHRAE Transactions*.

CONTACT DETAILS

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¹ HB2003 – Healthy Buildings 2003 : 7th International Conference, National University of Singapore, 7-11 December 2003

² ASHRAE – American Society of Heating, Refrigerating and Air-conditioning Engineers