Life-cycle cost analysis for constant-air-volume
and variable-air-volume air-conditioning systems

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Abstract

This study presents a life-cycle cost analysis using detailed load profiles and initial and operating costs to evaluate the economic feasibilities of constant-air-volume (CAV) and variable-air-volume (VAV) air-conditioning systems. The present-worth cost method for life-cycle cost analysis is applied to a sample building located in Adana, Turkey which can be conditioned with CAV or VAV systems. In the analysis, two different uses of the building (as a school or as an office center), two different operating scenarios for air-conditioning system (scenario 1 and scenario 2) and two different economic measures (developed and developing economy) are considered. It is found, for all the cases considered, that although initial cost of the VAV system is higher than that of the CAV system, the present-worth cost of the VAV system is lower than that of the CAV system at the end of the lifetime due to lower fan-operating costs. © 2005 Elsevier Ltd. All rights reserved.

Keywords: Air-conditioning; Life-cycle cost; Present-worth cost; Constant-air-volume; Variable-air-volume

1. Introduction

Selecting the most suitable and economic air-conditioning system among the available many alternatives is one of the important problems that engineers usually
An air-conditioning system that saves operating costs usually requires a higher initial investment. In this case, engineers should decide whether it is worth paying the extra first cost for a system that has lower operating costs [1].

Air-conditioning systems can be categorized according to the transfer of heating and cooling energy between central plants and conditioned building-spaces. There are four basic system categories: all-air systems, air- and water-systems, all-water
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