

## **Integrating the analysis of uncertainties involved in air conditioning into life cycle costing – A fuzzy approach**

A A D A J Perera and R C R Perera

*Department of Civil Engineering, University of Moratuwa*

Though life cycle costing (LCC) is a familiar concept, its application has more limitations in construction industry due to the concept of “future is uncertain”. The prime objective of this ongoing project is to ascertain the importance of LCC in buildings considering items with uncertainty. The life cycle cost analysis for unitary air conditioning systems would minimize the limitations in its application.

Many factors affect operating cost of an air conditioner. Indoor and outdoor temperature, humidity, number of occupants and period of operating is identified as the most linguistic variables.

Fuzzy logic is employed to handle the inherent uncertainty in these variables to predict the operating cost in this research. It overcomes the shortcomings in using sensitivity analysis and probabilistic techniques.

Fuzzy systems are capable of handling imprecision terms that are normally part of natural language. This directly integrated with the concept of “computing with words” in contrast to that of manipulating numbers and symbols. The former deals with linguistic and perceptions while the latter deals with crisp and exact measurements.

The fuzzy system was developed carrying out interview surveys with air conditioning experts. Development of a fuzzy expert system includes three main steps as fuzzification, rule base evaluation and finally defuzzification. Under fuzzification, the membership functions defined on the input variables (temperature, humidity etc) are applied to their actual values, to determine the degree of truth. Then the set of rules are evaluated to govern the system’s behavior and finally the fuzzy output set is converted to a crisp value under the defuzzification stage.

With the Fuzzy expert system the LCC for air conditioning can be predicted with minimum errors of uncertainty.