Air-Quality-Based Adaptive A.I. Algorithms For Improvement Of Efficiency In Environmental Regulation Systems

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INTRODUCTION:

The design of air conditioning systems follows methodologies based on sector regulations parameters, looking at general technical specifications that are often far from reality. This methodology involves energy consumption not necessary by the actual use as the systems. Just think of the use of meeting rooms or large open spaces with many “virtual people” forcing high dimensional parameters.

The last element concerns the exclusive use of artificial sources without considering the possibility of using external conditions to improve indoor air quality.

The measurement of the environmental parameters, both inside and outside the building, allows an adaptive controller to select the most convenient source, for example natural elements, thus reducing consumption related to the production of conditioning fluids.

This type of control also allows you to evaluate conditions in which spaces are not used to a lesser extent than what is defined in the project. This guarantees further energy savings as the portion of unused heat transfer fluids is not produced.

AIM:

The measurement of air quality parameters combined with artificial intelligence algorithms allows to increase the efficiency of the climate management systems of a building.

In addition, greater user comfort increases work productivity.

MATERIALS AND METHODS:

A study was carried out inside an 8000sqm building for office use with a variety of environments ranging from single rooms to open spaces to meeting rooms.

The study was carried out in order to analyze the air quality parameters both inside and outside the building and to apply the best management action of the equipment.

In order to act on the equipment, it was necessary to insert actuators on the windows and to equip the air ducts with variable flow boxes for the dynamic management of the air handling units.

CONCLUSIONS:

The study shows that it is possible to reduce the use of classic climate management systems by 15% with consequent energy savings.

KEYWORDS:

Air Quality, Carbon Dioxide, Volatile Organic Compounds, Building Automation, Optimal Control, Adaptive Control, Neural Networks, Fuzzy Regulator.

BIOGRAPHY:

Maurizio La Motta graduated in Building Engineering in 1999 and began to gain experience within multinationals in the field of facility management. In 2009 he became CEO and technical director of Cool Projects srl, a company engaged in Research and Development activities and in the design and production of electronic boards in the Building Automation sector