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ESTIMATING THE INDOOR AIR QUALITY IN BUILDINGS WITH HEAT RECOVERY MECHANICAL VENTILATION SYSTEMS

Abstract: *Today, the buildings sector represents more than 40 % of the total energy consumption in the European Union. A significant part of energy consumption in buildings relates to building ventilation. Heating, ventilating and air conditioning systems (HVAC) are essential for the maintenance of a comfortable and healthy indoor environment for building occupants. In order to reduce energy costs, the mechanical ventilation systems with heat recovery are designed. Ventilation is one method to maintain good indoor air quality. The primary functions of mechanical ventilation systems include the delivery of outdoor air to the occupants, the removal of indoor contaminants and the maintenance of thermal comfort conditions in the occupied zones. This paper presents a method of mechanical ventilation systems modeling in buildings by using software EnergyPlus, with the special attention to the indoor air quality (air temperature, relative air humidity, CO₂ concentration).*

Keywords: *Buildings, Mechanical ventilation, Indoor Air Quality, software EnergyPlus*

1. INTRODUCTION

Heating, ventilating and air conditioning systems (HVAC) are essential for the maintenance of a comfortable and healthy indoor environment for building occupants. In developed countries the HVAC systems consume around a third of the total energy consumption of the whole society. In hot and humid countries, the energy consumption to cool and dehumidify fresh ventilation air constitutes between 20% and 40% of the total energy consumption by HVAC systems [1].

On the other hand, energy saving in buildings is being strictly regulated by official requirements and local authorities. Nowadays, the role of heat gains in the energy balance of a building is becoming more and more important. The advances in thermal insulation and air-tightness of

buildings' envelopes, which greatly reduce thermal losses and air infiltrations, increase ventilation requirements and, consequently, raise the thermal losses associated with the ventilation system. In a modern building, the ventilation losses may become more than 50% of total thermal losses [2]. Taking into account the above facts, the improvement of the efficiency in buildings ventilating systems to reduce their environmental impact constitutes a key issue.

The primary purpose of ventilation is to create optimal conditions, in terms of air quality and thermal comfort in indoor environments, for people living or working there, taking into account their health, comfort and productivity. The role of ventilation in residential buildings is mainly to maintain good air quality by diluting air pollutants. Today there is a variety of ventilation strategies in various

