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Experimental and theoretical investigation of air exchange rate of an indoor aquatic center

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Highlights

- Assessment of indoor environmental parameters on an indoor aquatic center
- Experimental determination of natural ventilation level through CO₂ measurements
- Limitations related to the implementation of methods in large spaces are discussed
- Simulation analysis for achieving adequate ventilation levels

Abstract

The achievement of thermal comfort conditions and acceptable air quality throughout reasonable energy consumption level, constitute critical issues for the operation of a sports center. Focusing on indoor aquatic centers, the problem is more intense, considering the evaporation rate of the swimming pool, its thermal needs, as well as the concentration on indoor air of substances used for water cleaning. Ventilation is of high importance for the achievement of acceptable indoor air quality; permitted by the outdoor humidity level, it may lead to accepted levels of indoor relative humidity, also contributing to energy saving. In this work, the air exchange rate of an indoor aquatic center is studied on an experimental basis. The actual air exchange rate during non operation and operation hours is determined according to the tracer gas decay and equilibrium analysis methods respectively; the air exchange rate was proven to be insufficient, given the international standard values. The discussion included limitations related to the implementation of the methods in large spaces as the studied one. Solutions for enabling adequate ventilation levels at the aquatic center are investigated through simulation analysis. The COMIS software is used for the calculations; the results demonstrate the need for implementing forced ventilation.

Keywords: indoor environmental parameters, indoor air quality, CO₂ concentration, ventilation, air exchange rate, indoor aquatic center

Nomenclature

A _D	Du Bois surface	[m ²]
C	concentration	[ppm] or [mg/m ³]

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