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NUMERICAL SIMULATION OF INTERNAL MICROCLIMATE INSIDE A LIVESTOCK BUILDING

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Abstract

In the current work, a numerical model for the prediction of temperature, air velocity, relative humidity and ammonia distribution released by sheep and goats manure inside a naturally ventilated livestock building is presented. Given that noteworthy amount of gaseous pollutants are emitted by the agricultural and animal husbandry activities, the study of the indoor microclimate is essential to be investigated for the healthy growth of the breeding livestock. The developed numerical model is satisfactory validated by recorded measurements in the building. The analysis reveals that the natural ventilation of the building is effective, although it is observed relative high temperatures in the cores of the recirculations inside the building. *ACh* (Air Changes per hour) and internal climate indexes like *THI* (Temperature Humidity Index) and *Twc* (Wind Chill Index) were calculated in order to reveal the existence of areas where cold or heat stress conditions hold. According to the developed flow pattern, it is estimated the ammonia distribution internally. Due to the adequate ventilation of examined cases, no areas with excessive ammonia concentration are predicted neither marked areas with heat or cold stress climatic conditions are found. In buildings with relative geometry, areas away from openings, are candidates for the appearance of hot stress conditions, even when the required ventilation rates are satisfied. However, this is expected to be happened for higher external temperatures from the examined. This implies that, large and concentrated openings cannot substitutes, in terms of efficiency, the smaller and equally distributed over a building's sides openings.

Keywords: CFD, indoor microclimate, sheepcote, simulation, *THI*

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