XVII[th] World Congress of the International Commission of Agricultural and Biosystems Engineering (CIGR)

Hosted by the Canadian Society for Bioengineering (CSBE/SCGAB)
Québec City, Canada June 13-17, 2010

A SUMMARY OF VENTILATION RATE MEASURING TECHNIQUES THROUGH VENTILATED BUILDINGS

SEZIN EREN OZCAN[1], ERIK VRANKEN[1], DANIEL BERCKMANS[1]

[1] S.E. OZCAN, Belgium, sezin.erenozcan@biw.kuleuven.be.
[1] E. VRANKEN, erik.vranken@biw.kuleuven.be.
[1] D. BERCKMANS, daniel.berckmans@biw.kuleuven.be.

CSBE100472 – Presented at Section II: Farm Buildings, Equipment, Structures and Livestock Environment Conference

ABSTRACT The measurement of the total air flux through naturally ventilated openings is not straightforward. Direct and indirect measuring techniques are available for determination of ventilation rates in naturally ventilated buildings. Direct measuring methods include measuring fan, propeller gauge, hot wire anemometer, particle image velocimetry, laser Doppler anemometer, and transit time sonic anemometer. Basic disadvantage of direct measuring techniques is that they are generally used for point or local measurements of air velocity. In order to have the total ventilation rate through the whole building, a "system" is required to measure simultaneously the airflow both in magnitude and direction at a number of locations. Indirect measuring techniques include heat balance, CO_2 balance, pressure difference, CFD analysis, tracer gas measurements, multizone modelling, and zonal models. These methods consider the whole system, and therefore, provide a possible tool for determining air flux through the building envelopes. Methods based on computer simulations (CFD, multizone models, etc.) should be validated against experimental data. However, in most cases, those validations are lacking, or do not indicate the accuracy of the method. Tracer gas measurements are mostly used as a reference method in validations. However, accuracy of this technique should also be studied. Most indirect measuring techniques suffer from the problem of imperfect mixing of air within the ventilated structure. Therefore, the accuracy of tracer gas measurements should be improved by using information of imperfect mixing within the building. The main objective of this study is to review available techniques while putting emphasise on their accuracies. Additionally, advantages and disadvantages of each method will be discussed.

Keywords: Ventilation rate, Natural ventilation, Measuring techniques, Tracer gas, Accuracy.