AIR-DISPLACEMENT SYSTEM MALFUNCTION PARAMETER WITH ITS VISUALISATION

Lubos Hach [1], Yasuo Katoh [2], Junji Kurima [2]

Pardubice University, Faculty of Chemical Technology, Studentska 84, Pardubice, Czech Rep.

[2] Yamaguchi University, Faculty of Engineering, Tokiwadai 2-16-1, 755 8611 Ube, Japan

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Indoor air quality supply as part of HVAC industry offers complete solution of active air duct systems nowadays. It means that an autonomous large air-displacement system (ADS) is being equipped with sensors monitoring and, with added controller, also controlling its function. This work presents the way of data processing in order to visualize the actual air supply state in the air duct system with in-advance-warning function.

Depending on the investor's request and/or customer's order there might be some non standard tasks including special filters, air-ionization equipment etc. which, however, must be subordinate to safety, fire department etc. norms (ISO standards). Using the basic fluid motion equation with formal derivation of boundary layers would produce a quality (parameter) signalizing well ahead any malfunction of the air supply segment stemmig from worsening air supply conditions. The signal caries with the information in lateral direction to the air velocity and could detect the speed of an efective cross-section decreasing.

References

[1] Hach, L., Katoh, Y., Kurima, J.: Reduction of Convective Heat Transfer Coefficient within Stagnation Zone on Uniformly Cooled Outdoor Wall, The 16th Inter. Symposium on Transport Phenomena (ISTP-16), ISBN 80-86786-04-8, Prague, August 2005.

[2] ASHRAE. 1992. *ANSI/ASHRAE Standard 55-1992, Thermal Environmental Conditions for Human Occupancy*, Atlanta: American Society of Heating, Refrigerating, and Airconditioning Engineers, Inc.

[3] Recknagel, H., Sprenger, E. and Schramek, E.-R.: *Taschenbuch für Heizung und Klimatechnik*, R. Oldenbourg Verlag, 1997, München, Germany.

[4] Davidson, L., Ventilation by Displacement in a Three-Dimensional Room: A Numerical Study, *Building and Environment*, Vol. 24, pp. 263-372, 1989.