Unsteady-state human-body exergy consumption rate and its relation to subjective assessment of dynamic thermal environments - DTU Orbit (08/11/2017)

Unsteady-state human-body exergy consumption rate and its relation to subjective assessment of dynamic thermal environments

Few examples studied applicability of exergy analysis on human thermal comfort. These examples relate the human-body exergy consumption rate with subjectively obtained thermal sensation votes and had been based on steady-state calculation methods. However, humans are rarely exposed to steady-state thermal environments. Therefore, the first objective of the current paper was to compare a recently introduced unsteady-state model with previously used steady-state model using data obtained under both constant and transient temperature conditions. The second objective was to explore a relationship between the human-body exergy consumption rate and subjective assessment of thermal environment represented by thermal sensation as well as to extend the investigation towards thermal acceptability votes. Comparison of steady-state and unsteady-state model showed that results from both models were comparable when applied to data from environments with constant operative temperature. In contrast, when applied to data with temperature transients the prediction of particular models differed significantly and the unsteady-state model resulted in better prediction of mean skin temperature. The results of the present study confirmed previously indicated trends that lowest human body exergy consumption rate is associated with thermal sensation close to neutrality. Moreover, higher acceptability was in general associated with lower human body exergy consumption rate. (C) 2016 Elsevier B.V. All rights reserved.

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