CONVECTIVE HEAT RATE CHANGE EFFICIENCY BY AIR-DISPLACEMENT SYSTEM AT COOLING-OFF REGIME

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In this work are summarized some findings on building envelope energy losses altered by means of an air-distributed system. There was investigated thermal state, in which the air-displacement system acts on behalf of cooling-off regime in order to remove heat amount accumulated in the occupied space during the day-light period. This led to readjusting of air inlet parameters according to the energy considerations in the cooling-off period beside indoor air quality level, which is required primarily. The extent of the ratio of the heat amount removal in surrounding wall on the inlet air parameters was subjected to the experimental investigation. Then, the same situation was simulated on 2D-model with cooling wall under natural convection regime [1] and finally compared. From both thermal states was calculated conventional heat rate stripped by convection on the inner wall surface in cooling-off period. The difference showed certain heat loss differences under both scenarios: as expected, accelerated heat losses on beginning of the cooling-off period where linked to the higher temperature gradient on the wall surface. The effectiveness of the process decreases, thus natural ventilation could fulfill the remaining cooling-off period.

Primary function of air-displacement systems is a supplying fresh air into the occupied zone. Simultaneously, the contaminated air volume stemming from technological appliances and devices as well human-generated pollutants are stirred away and replaced with air mass of an acceptable quality.

Indoor air delivery requirements are standardized on national and international level [2], [3] etc. and may include:

- (chemical) content of fresh air volume supply depending on ventilated space purpose and specific conditions,
- velocity profiles, time-depending air supply characteristics,
- air temperature, humidity levels.

The efficiency of the overall air-supply system measured on above mentioned qualities will be reduced, if mixing increases between both air masses during the replacement process. State-of-the-art air displacement systems with it right inlets/exhausts design and location enhance the effectiveness accordingly.

References

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