PI-CONTROL OF INDOOR AIR ENVIRONMENT (TAKAHASHI SETTINGS)

L. Hach 1, Y. Katoh 2

1 Institute of Applied Physics and Mathematics, Faculty of Chemical Engineering,

University of Pardubice, 532 10 Pardubice, Czech Rep.

2 Department of Mechanical Engineering, Faculty of Engineering,

Yamaguchi University, 755 8611 Ube, Japan

In this work is discussed effect of standard PI-control of indoor air temperature for a space with mean radiant temperature (MRT) consideration. The control of indoor thermal environment of typical residential spaces often means the maintaining desired air temperature, however, the influence of radiant temperature would compensate secondarily. There are several ways of passive and/or active arrangements to decrease the gap among otherwise correctly working SISO-controller and actual temperature comfort of the occupants. There may not exist the universal guidelines for optimal control settings due to variety of cases of radiant and air temperature balance, however for their usual differences is sufficient to apply relation between both qualities and substitute with the outcome the real input signal onto the controller. The simulation of the Takahashi predictions for PI-controller compared with other control method (Cohen-Coon, Ziegler-Nichols) in MATLAB/Simulink environment shows figure below.
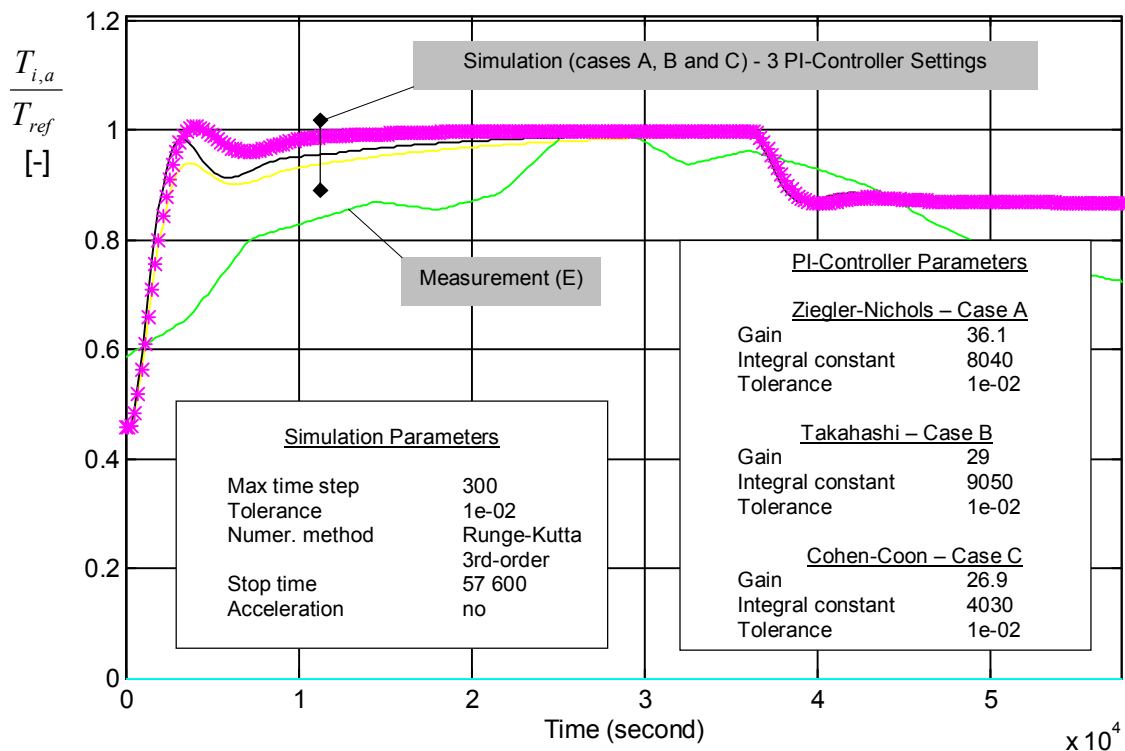

Figure: *Comparison of global air temperature response of reference room.*
A, B, C - simulation cases (from upper to bottom), E - measurements. PI-controller with Ziegler-Nichols (A), Takahashi (B) and Cohen-Coon settings (C),$|0.1| \cong 0.5$ K; $T_{ref} = 293$ K.

Key Words:

Controller tuning, mean radiant temperature, thermal comfort parameter, simulation model.