

DISCUSSION

NOTE ON INACCURACIES IN THE PAPERS BY MAIKOV [1] AND MAIKOV AND PIL'SKII [2] IN THE COLLECTION "INVESTIGATIONS AND CALCULATIONS OF THERMAL-ENERGY AND CHEMICAL-ENERGY PROCESSES" (MASHGIZ, 1961)

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In the paper "Temperature distribution in the coal charge of a coke oven" [1], the problem of heating a coal charge in a coke oven was examined taking into account the variation in thermal properties. It was assumed that the charge in these quantities occurs discontinuously on attaining the reaction temperature t_* . The author chose the origin of coordinates in the plane of the isotherm with temperature t_* , denoting its position relative to the oven by the variable x_* . The problem examined was reduced to solving the equations

$$\frac{\partial t_1(x, \tau)}{\partial \tau} = a_1 \frac{\partial^2 t_1(x, \tau)}{\partial x^2} \quad (\tau > 0; 0 \leq x \leq R - x_*), \quad (1)$$

$$\frac{\partial t_2(x, \tau)}{\partial \tau} = a_2 \frac{\partial^2 t_2(x, \tau)}{\partial x^2} \quad (\tau > 0; x_* \leq x \leq 0) \quad (2)$$

with the initial condition

$$t_1(x, 0) = t_2(x, 0) = t_0 \quad (3)$$

and the boundary conditions

$$\lambda_1 t_1'(R - x_*, \tau) - \frac{\lambda_c}{\delta} [t_c - t_1(R - x_*, \tau)] = 0, \quad (4)$$

$$\lambda_1 t_1'(0, \tau) - \lambda_2 t_2'(0, \tau) = 0, \quad (5)$$

$$t_1(0, \tau) - t_2(0, \tau) = 0, \quad (6)$$

$$t_2'(-x_*, \tau) = 0. \quad (7)$$

An integral Laplace transformation is used to solve the problem. The boundary conditions (4) and (7) for the transform of the function were written by Maikov

as follows:

$$\lambda_1 T_1'(R - x_*, S) - \frac{\lambda_c}{\delta} \left[\frac{t_c}{S} - T_1(R - x_*, S) \right] = 0, \quad (8)$$

$$T_2'(-x_*, S) = 0. \quad (9)$$

These equations are true only when x_* is constant. However, the author writes: "As the temperature in the oven rises, the plane of the isotherm with temperature t_* moves out from the wall to the middle of the oven, and reaches the center of the oven at some instant of time τ_* ." This means that x_* is a function of time, which is incorrect, and so also are the results of [1].

A similar error was committed in the paper "Thermal conditions in a coke oven with electrode heating" [2].

It is known that the thermal coefficients of a body vary discontinuously in heat-transfer processes associated with a change of state of aggregation. The problems set in [1] and [2] may be examined by the method used to solve problems in soil freezing, and then the heat liberated in conversion from one state of aggregation to another must be assumed equal to zero.

REFERENCES

1. V. P. Maikov, collection: Investigations and Calculations of Thermal-Energy and Chemical-Energy Processes [in Russian], Mashgiz, 107-112, 1961.
2. V. P. Maikov and I. Ya. Pil'skii, collection: Investigations and Calculations of Thermal-Energy and Chemical-Energy Processes [in Russian], Mashgiz, 113-122, 1961.

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