DETERMINATION ELECTRICAL PARAMETERS LUMPY FERROMAGNETIC CHARGE WHEN HEATED TO THE CURIE POINT

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Abstract **- The article investigates the changes in the electrical parameters of the induction crucible furnace with a ferromagnetic lumpy charge. Methods of research change the settings of the induction furnace with heating to the Curie point was chosen physical modeling as an analytical description of the system to obtain extremely difficult.**

Keywords**: Induction heating, lumpy charge, physical modeling, similarity theory, the Curie point.**

I. INTRODUCTION

To study the electrical parameters charge lump was conducted physical modeling on a scale model of the induction furnace. For the simulation of the raw-material agglomerates were used two pieces of steel wires of different diameters (2.9 mm and 1.1 mm). Using the theory of similarity, the results can be applied to the industrial furnaces with higher capacity [1].

II. SUMMARY OF RESEARCH

In practice, as a rule, complete similarity conditions are not met, which forces move to approximate modeling, in which the model is reproduced in the same physical process, and that in the real object [2]. Figure 1 is a sketch of a simulated induction furnace. The parameters of the model installation following: d1 = 94mm, d2 = 67mm, l1 = 76 mm, l2 = 113mm, z0 = 14mm, the number of turns of the inductor - 6.

During the experiment, the values measured inductor current *I*, a voltage inducer *U*, the power supply frequency *f*, active power *P* consumed by the inverter and the average temperature of the load *T*.

From these data we can derive the series equivalent circuit parameters of the inductor (loss resistance *R* and inductance *L* of the inductor - charge) during the heating process. It is calculated parameter *L* instead *X* due to the fact that in the process of heating the frequency power supply automatically adjusts to varying loads.

Processing of the experimental data was performed as follows. The power factor of an inductor-charge:

$$\cos\phi = \frac{\eta P}{UI}, \qquad (1)$$

where η – efficiency of the frequency converter.

The impedance of the inductor partition request:

$$Z = \frac{U}{I}, \qquad (2)$$

from which we obtain the required values of *R* and *L*:

$$R = Z\cos\phi, \qquad L = \frac{Z\sqrt{1-\cos^2\phi}}{2\pi f} \qquad (3)$$

Dividing the obtained values of *R* and *L* in the value of the initial time of heating, you can go to the relative units *R** and *L**.

Calculated according to the parameters of the serial equivalent circuit inductor represented graphically in Fig. 1 at two different diameters of the raw-material agglomerates ferromagnetic steel in the filling as a function of temperature.

From these graphs, you can notice a pronounced qualitative temperature change curves near the Curie point. Where in the reactance of the inductor is changed slightly, compared to the activity which varies three times, when passing through the magnetic transformation point of ferromagnetic steel.

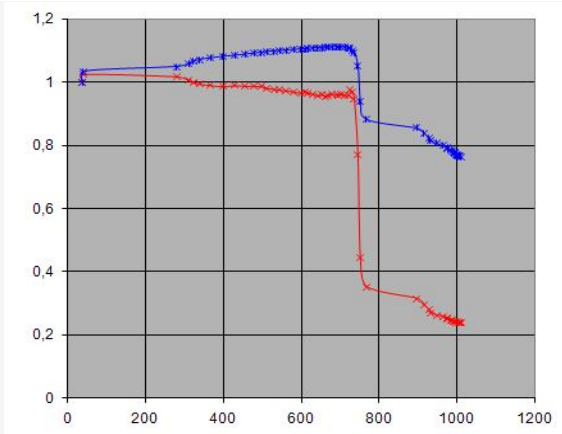

Fig. 5. The dependence of the relative resistance R* and the relative inductance L* of the serial equivalent circuit inductance upon on. temperature ferromagnetic charge (1.1mm diameter charge)

III. CONCLUSION

When heated lumpy charge equivalent load resistance of the series equivalent circuit changes insignificant, but after the transition through the Curie point is significantly reduced. Reactance first increased by 10%, after the Curie point is reduced by 20%.

Changes to the parameters during the heating of the ferromagnetic charge raised the question of bringing the load parameters to the parameters of the power supply, because the optimal choice of the installed capacity of the frequency converter.

IV. REFERENCE

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