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ABOUT INCREASE OF WORK RELIABILITY FOR ELECTRODES OF ARC STEEL-SMELTING FURNACES

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Implementation of powerful arc steel-smelting furnaces (ASSF) demands the fundamental improvement of quality for graphite electrodes related with the increase of admissible density current from 15-20 to 30-32 kA/sm^2 possible, by the increase of them mechanical durability and thermal firmness, and also by the decline of specific electric resistance [1].

In the structure of charges in relation to a redistribution in ASSF electrodes there is a 15 % general size, which causes the necessity of development for measures, sent to their decline. At the same time decide a question in relation to the improvement of quality and perfection of technology of making of electrodes, in particular, productions of high density electrodes.

Processes which determine the expense of electrodes divide into continuous (oxidization, sublimation and erosion) and periodic (breaking of working part, and also flushing at heat beats). For the decline of continuous expense of electrodes apply protective coating by metallization or other methods, and also to the work of ASSF on a long arc with the corresponding decline of strength of current, and also combination of long arc with a foamy slag (obstacle to erosion of graphite by the splatters of liquid metal and more stable burning of arc).

Periodical processes which determine the expense of electrodes assist the increase of unproductive outages and to ingress of graphite pieces to fusion which reduces quality of steel and efficiency of ASSF work. Butt-end periodic losses which conditioned by thermal, mechanical and chemical actions on the lower part of electrode are characterized by creation of flushing, transversal and longitudinal cracks. Except for that, on account of the sharp increase of the mechanical loading and weakening of nipple knot reliability of passed to the current is violated, because pin properties of nipple knot are determined by exactness of mechanical treatment of sections of electrodes.

The noted losses more frequent look at in the conditions of developed conicity of electrode which is characteristic for the protracted period of affinage of metal, when speed of expense of side surface exceeds speed of expense of working part.

All actions divide into oscillation, beat, static and linear. A most danger is presented by oscillation and beat actions. It is set by researches, that the oscillation loading for electrodes of 100-ton ASSF make up 8-10 kH and have alternating character which reduces strength descriptions of their material. Tensions which arise up in an electrode depend on a value, form and time of action of forces, their periodicity and frequency, and also point of appendix of resulting effort.

An electrode tests the compatible action of bend with dilation (compression). As a

bend is created by transversal forces, both normal and tangent tensions operate in the cut of electrode. There with that correlation of diameter of electrode to its length for ASSF made 1:7.8, tangent tensions are insignificant and calculations on strength execute only in relation to normal tensions.

It is set that the maximal values of tensions, which develop in the electrodes of ASSF of the indicated cereus, exceed a possible size and especially at effort of traction character.

For the decline of amplitude of vibrations for the system of electrode holder of ASSF damper roller supports are worked out, which assist more intensive dispersion of energy of vibrations that substantially reduces amplitude of their vibrations in the resonance modes.

Minimum oxidation a side surface provides electrodes, executed from the graphite of high-density and small porosity, however at the increase of graphite density look the decline of its heat-resistance.

More subzero density of foreign electrodes is explained by the requirements of heat-resistance, and small specific electric resistance (almost in 1,5 times less than for domestic) assists the decline of losses of electric power, diminishing of temperature of heating, a. thus, and to lowering of measure of oxidization of side surface.

There is offered construction of device for irrigation of electrode [2], where foresee the joint fixing of circular aquatic nozzle on a bracket. The feature of its consists in tacking of pressure slide-valve to the circular aquatic nozzle by means of metallic hose, pipeline and sectional flange connection. On the other hand a slide-valve is connected both to pressure and downlow highway. In the case of prop of electrode the joint fixing of circular nozzle and presence of counterbalance allow its to decline a nozzle and freely to move downward, with the next returning of nozzle in initial horizontal position by means of the system of balancing. Work of slide-valve provides the permanent size for expense of liquid regardless irrespective from position of electrode.

Conclusion. Reasons of subzero firmness of electrodes of ASSF are certain. A calculation chart for determination of the tense state of electrodes depending on the mechanical loading is worked out. Devices for the decline of harmful vibrations of електродотримачів of ASSF are offered, and also for diminishing of losses from loss of side surface of graphite electrodes.

Reference

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