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INCREASE OF EFFICIENCY FOR THERMAL WORK OF PUSHER FURNACE CONVEYOR TYPE

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Thermal work of conveyer furnace of pusher type for antiflake treatment of railway wheels is analyzed. The variant of its reconstruction is worked out and possibility of realization of this measure is proved.

Keywords: conveyer furnace of pusher type, thermal work, antiflake treatment of wheels, recirculation, electric radiator

Heat and thermal furnaces which use in metallurgy and engineer of Ukraine are universal aggregates which provide thermal treatment of considerable assortment of metal, the here marked furnaces work at limits of out-of-date technologies and, as a rule, are physically threadbare. Therefore necessary is a reconstruction of production and creation economic effective and environmentally safe technologies.

To the last time an energy-savings during heating of metal in furnaces was related with directions of optimization and rationalization of the fegimes for heating of metal; an increase of efficiency works of heat devices, which will utilize the warmth of off-gas, and also decline of thermal losses from the work volume [1].

The today marked directions are outspend the possibilities of perfection for thermal work of the furnace aggregates, which causes the necessity of careful analysis of technological processes for the search of the new non-standard approaches near modernization of production.

The purpose of this work is determination of ways for increase of power efficiency of pusher furnace of conveyor type for heat treatment of railway wheels at the conditions of OJS «Enterpipe LPP» and development of variant for reconstruction of select thermal aggregate.

In Ukraine OJS «Enterpipe LPP» is a most producer and supplier of steel pipes of wide spectrum for the use, and also one of producers of railway wheels and bracers. Marked multi-field modern plant has an own steel-smelting complex, five tube-rolling, railway-wheel and wheel-tread-bracer production.

Most full to conditions of operation activity are answered mediumcarbon and high-carbon constructive high-quality steels with enhanceable content of manganese without (or) with addition to vanadium.

At the technological line of making of railway wheels of OJS «Enterpipe LPP» conveyer furnaces for antiflake treatment of wheels are located after a press-rental area.

It is known [2], that the wheeled steel with content hydrogen more than 4 sm^3 on 100 g of metal becomes flake-sensitive. To, for warning of origin of flakes, wheel

cool on air from the temperature of end of rolling (900-1000 °C) to the temperature on the surface of hub 650-600 °C, whereupon give them to the conveyer furnace for isothermal self-control, duration of which makes up 4,5 hours [3].

At length of the work volume a conveyer furnace is divided into five thermal zones with the individual bearing-out heating, which are located contiguously with the longitudinal wall of furnace which dissociates heating from the work volume of furnace. In every heating natural gas is burned by means of three burners as GLP-9, presentations of air on burning carry out by ventilators.

Set temperature the regime of furnace is provided by means of recirculation for combustion foods, which mix up from recalculate and through the system of sub-hearch channels send furnaces to the work volume.

Heating engineering estimation of furnace of conveyer type carry out by the making of thermal balance for process of heat treatment.

The sources of warmth supply to the furnace are mixture of fresh foods of combustion and recalculate with physical warmth 7.639 MW. This warmth is consumed on heating of wheels (0,213 MW), compensation of charges through lying of furnace (1.494 MW) and losses with smoke gases which go out a furnace (8.975 MW). To addition, physical warmth of recalculate that add to combustion fresh foods presents 3.041 MW.

As go out the results of calculation, during isothermal self-control of wheels at furnaces, considerable part of warmth, that get from combustion of fuels, spend on compensation of thermal charges of the work volume of furnace and with foods of combustion, which depart from a furnace. The marked charges of warmth follow to decrease to the minimum.

Examine possibility of trip of conveyer furnace on work in the reserved regime, when technological gases do not go out a furnace, circulating in her work volume, and the necessary quantity of warmth is tricked to them from outsourcing of energy.

At that rate consumer power of furnace, will consist of the articles of heating of wheels and compensation of thermal charges of the work volume, id est presents 1.707 kW.

Taking into account relatively the low level of temperature of antiflake treatment and absence of the special demands to the composition of atmosphere, the necessary temperature of furnace, as a variant, it can provide by application of electric radiators.

The calculation of electric radiator is executed on methods, resulted at paper [5]. The set electric power of furnace is accepted by higher than consumable value on 30-40 % taking into account the senescence of aging of radiators, and also possible vibrations of voltage in an electric main 2.30 MW.

Account of the increased temperature of radiators at the places of fastening, allows to consider that them a maximal temperature arrives 1323 K. For such temperature the alloy of EXH80 has a corresponding maximal working temperature.

Placing of electric radiators in a conveyer furnace is foreseen in place of the existent bearing-out heating for combustion of natural gas.

During heating of pusher conveyer furnace by natural gas the specific expense of warmth make 2.275 Jou/kg of products. For the costs of fuel at the level of 4200 hrn.s after 1000 m^3 of natural gas the cost of heat treatment presents 0.2823 hrn.s/kg.

During trip of conveyer furnace on the electric heating her consumer power make 1,707 kW, that is the specific expense of warmth does not exceed 0.4843 MJou/ kg.

If a price on electric energy for industry make 1.1473 hrn.s after 1.0 kW by hours, then at that rate the cost of heat treatment presents 0.1543 hrn.s/kg.

Thus, trip of furnace on the electric heating will allow reducing charges for the article «energy carriers» to the quantity 0.128 hrn.s/kg.

Conclusions. The calculations executed in work gave results which up to a point answer the operating factors of work for conveyer furnace for heat treatment of wheels. An existent furnace is not an economic thermal aggregate, that it is related to her construction and features of technological process. Trip of furnace on the electric heating results to liquidation of warmth loss with combustion foods, which go out a furnace that allows providing the decline of prime price of heat treatment after the article «energy carriers» on 128.0 hrn.s on every ton of wheels.

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