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INDUSTRIAL RESEARCHES AND DEVELOPMENT OF HEATING FOR CHAMBER RECYRQULATIVE FURNACES WITH SOLE BURNARS

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The analysis of economic factors of heat work of the chamber recyrqulative furnaces with sole burners at conditions of PAJ «Electrometallurgical plant «Dneprospetsstal′» is carried out from point of modernization of the system of heating and particularly its basic element – burner-like device. By experimental sampling utility expedience of introduction of the developed burner at industrial conditions of this plant is showed. A complex economic effect due to optimization of the temperature and temporal modes of work for furnaces of this type is presented.

Keywords: chamber recyrqulative furnace, sole burners, thermal treatment, , metal, modernized burners, economic effect

For realization of normalization processes, softening and structural annealing of material blank, of high quality and bundle semi-finished rolled product in the thermal workshop of PAJ «Electrometallurgy plant «Dneprtspetsstal′» chamber recyrwulative furnaces with the sole burners are applied.

In the process of exploitation of these heat aggregates a serious defect was educed: during performance a period of self-control of metal, when the expense of fuel on a furnace goes down to the level of 400-500 m^3/hour, here stability of recyrwulation process of the furnace gases is not provided, and, consequently, and evenness of heating of metal charge, that leads to the increase of duration of foregoing period of its treatment. As a result, there is a decline of the productivity of these heat aggregates asms and increase of expense forf gaseous fuel.

With the purpose of removal of the mentional defects one of chamber recyrwulative furnaces converted on the one-sided heating with simultaneous expansion of output and recyrwulative channels.

However after modernization of furnace we not able to provide all possibilities stopped up at its work with the existent burners of type «pipe in a pipe». Got results were unstable, and absence of secure burner-like devices hampered the reconstruction of other furnace aggregates of this type.

The mentional defect succeeded to be removed at development of burner of the partial preliminary mixing, characterized by the presence of area of sudden expansion [1,2]. In the process of experimental sampling of work of burner-like devices it on a furnace was set, that at all considered modes, including limiting, when an expense of air was maximally possible, and expense of fuel was minimum, work of burner-like devices differed by stability to tearing away of flame.

High stability of process of burning, conditioned by the feature of construction of the worked out burner-like devices, allows to provide their stable work without the used for setting fire devices. The extended limits of adjusting of these burners enable to use the systems of automatic control for realization of any heat mode.

In addition, we applied the impulsive serve of fuel and air in the period of self-control of metal in a furnace and carried out organization of the zonal mode of its heating. For this purpose in the work volume of furnace distinguished five areas and in every area we determine sensors of temperature, signals from which gave on a recording device. In the area located near a cap in the first variant saved burners, located to meet to each other. Control by them it was carried out synchronously, on a signal from one sensor. Other burner-like devices regulated individually. Such system provides the automatic stabilizing of temperature on all work volume of furnace.

Taking into account the results of the experienced annealing we carried out the revision of chart of heating of furnace and system of automatic control of temperature. Two burners of the first area were changed on one burner device of enhanceable power, which steadily works on all modes, that allowed considerably to improve aerodynamics in the work volume of furnace and remove the underheating of metal in the first area, and also to simplify distribution of pipelines and adjusting of temperature.

The productive program of the furnace area, since the period of modernization of aggregates from data of services of PAJ «Electrometallurgy plant «Dneprospetsstal′», is presented in a table. Here charges over of gaseous fuel are also brought on years for period of 1993-2009 in absolute and relative units, specific normative and actual values of expense of fuel on unit of products, and also volume of decline of its consumption.

A table - Dynamics of economic factors of work of the furnace area

Year	Volume of thermal treatment of metal, t in a year	Annual expense of fuel on heat treatment of metal	Specific expense of fuel, kg of e.f./t		Volume of decline of consumption of fuel
		t. of e.f. in a year	normative	actual	
1993	110200	10314	95,6	93,6	220,4
1994	108000	11060	104,7	102,4	253,4
1995	102500	10437	102,5	101,8	77,1
1996	109100	12568	115,3	115,2	11,0
1997	108000	11870	113,2	109,9	363,6
1998	112541	12720	100,5	97,1	347,0
1999	107895	13171	99,0	98,4	60,0
2000	112919	11217	100,0	94,4	690,0
2001	78005	79780	95,0	95,0	0
2002	92773	9226	95,0	94,2	75,4
2003	86383	8439	95,0	93,9	92,5
2004	118780	11214	94,6	91,2	400,5
2005	122291	11690	95,0	93,4	192,6
2006	125199	11758	95,0	92,2	347,3
2007	125432	11523	95,0	90,4	572,0
2008	105186	9940	95,0	93,0	208,4
2009	49107	47282	95,0	90,5	204,4
Total					4171

As be obvious from a table, logical and hard intercommunication is fixed between the volume of thermal treatment of metal and consumption of fuel. Thus there are only insignificant rejections which are explained by the organizational moments of production (outages of open-circuit, plan and emergency repair service, starting-up and adjustment works).

Conclusion. Coming from foregoing, it is possible to draw conclusion, that the offered modernization of the heating systems of chamber recyrwulative furnaces with the sole burners after introduction and long-term exploitation showed oneself as technically and the economic justified improvement of technological process, sent to the decision of astual problems of resource- and energy-saving, increases of the productivity of production, and also decline of unit cost.

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