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ABOUT INCREASE OF EFFECTIVENCY USING BLAST-FURNACE GAS IN STEAM GENERATORS HPP PAJ «METALLURGICAL COMBINE «ZAPOROZHSTAL′»

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There is considered work of steam generator GP-150 heat electropower of PAJ «Metallurgical combine «Zaporozhstal′» for the last six years. Possibility of increase of him is reasonable steam productivity and modernization is offered with the purpose of increase of energy efficiency due to the increase of heating surface for air heater, increase of carrying capacity of gas-burner devices on blast furnace gas, fluidizer of additional separator, and also diminishing of quantity of pipes serve of coke gas.

Keywords: effectiveness, secondary energy resources, the blast furnace gas, steam generator, modernization, the burner

Metallurgy as inalienable part of Ukraine economy works at the conditions of its crisis. Therefore every enterprise aims to diminish prime cost own products, inculcate the newest technologies, and also maximally to use the secondary power resources of own production.

On HPP PAJ «Metallurgical combine «Zaporozhstal′» is set seven steam generators for the production of technological vapor, including. three aggregates as GP-150.

During the production of technological pair steam generators GP-150 HPP apply the determined quantity of fuel, electric power and feed water. As a fuel is used blast-furnace gas (in full), coke gas (at its presence) and natural gas (in the case when other gas does not seize), and also fuel oil.

For works of steam generators the set presence of considerable vibrations of the productivity of energy sources. From one side, there is under loading of steam generators of HPP, and, from other, incomplete production of pair and electric power due to more cheap blast-furnace gas. Sometimes the volumes of blast-furnace gas, which act on HPP, exceed maximal possibility of its use on the complete loading of steam generators that also causes the extrass of blast-furnace gas on a reheat.

Steam generators of GP-150 equipped by the of the same type trivial torch gas-burners of construction of VGP UESM [1]. The noted gas-burners are placed on the lateral walls of steam generators and intended for incineration of mixture of blast-furnace, coke and natural gas, and also fuel oil.

For noted HPP actual are such measures, as diminishing of heat losses, electric power, which use on own necessities, minimum consumption of technological pair, maximal use of secondary power resources (blast-furnace gas and slay water).

Complete utilization of blast-furnace gas will enable to provide an energy-savings and will allow to save such power resource as natural gas, and also assists the production of additional pair which, in turn, converts into electric energy [2].

In work there are applied calculation-experimental method of researches, which combines the use of normative descriptions, previous researches and experimental data, and also calculations of separate constituents based on results of technological process..

As an analysis of actual operating factors of work of steam generator No 6 HPP PAJ the «Metallurgical combine «Zaporozhstal′» with steam productivity 41.67 kg/s for period from 2010 to 2015, its the steam loading in middle hesitated from 16.67 to 23.61 kg/s. At operating data of steam generator for works on blast-furnace gas its the maximal steam loading presents 26.67 kg/s. Temperature of gases which depart, in 2010-2012 was enough high (240-280 °C), in 2013 - its value went down and in 2014.2015 - folded ~ 220 °C of treason of expense of fuel depending on the presence of blast-furnace gas during 2010-2015 was substantial.

For the increase of steam productivity to 50 kg/s, and also to execute efficiency of work of steam generator it is suggested:

- to increase of area of convective surface of heating of air heater from 5940 to 7540 m^2 (on 27 %), that brings to diminishing temperatures over of gases, which depart, and increases of efficiency of steam generator work;
- additionally to set in the drum of steam generator of jalousie separator for the making of the saturated pair of necessary quality;
- to increase the quantity of pipes diameter a 133 mm for tricking of water to steam generator from eight to twelve.

For the increase of carrying capacity of burner devices of steam generator of GP-150 HPP is on blast-furnace gas it is suggested to decrease from eight to three quantity of pipes which coke gas is given to heating of steam generator. As calculations of gas-burner testify, its a maximal carrying capacity on coke gas will diminish (from 2.50 to 0.94 m^3/s), that is expedient.

By the calculations of the noted gas-burner of steam generator as GP-150 HPP is also set that its maximal carrying capacity on blast-furnace gas will increase from 14.4 to 16.9 m^3/s, id est. on 17.5 %.

After structural treasons of multihued planotorch gas-burners, that it is set on steam generator GP-150, and modernizations air heater range him steam loading will increase from 26.67 to 36.94 kg/s, id est. on 38,5 %.heat energy, which can be additionally got in steam generator GP-150 at its nominal loading, GJou, calculate as

$$Q_1 = k_1 \cdot k_2 \cdot (G_{ê2} - G_{ê1}) \ , \qquad (1)$$

where _ - a coefficient of unevenness of loading steam generator, GP-150; _ - a coefficient of count from t/hours on GJou.; _, _ -. middle steam productivity marked to steam generator to and after its modernization, t/hours, accordingly, _ = 96 t/hours, _ = 133 t/hours

Then _ = 204195.6 kJou.

Annual quantity of heat energy _, which can be additionally got in steam generator GP-150 due to complete utilization of blast-furnace gas, kJou, calculate as

$$Q_{\text{äîä}} = \frac{k_3 \cdot \Delta V_{\text{ä.ã}}}{k_4} \ , \qquad (2)$$

where _ is a rate on conversion of thousands m^3 fuel on t.c.f., _ = 0.143; _ - a specific expense of t.c.f. on a production 1.0 GJou in 2015, _ = 0.175.

Then _ = 98.93 GJou.

A previous economic effect _ from introduction of measures on modernization of equipment, million. hrn., expect on a formula

$$E_{\text{ïîïî}} = Q_{\text{äîä}} \cdot N_{\text{ô .å.}} \ , \qquad (3)$$

where _ is a cost of heat energy in 2015, hrn./of GJou; _ = $484.5 \cdot 10^6$ hrn./GJou.

The value of the noted effect presents _ = $98.93 \cdot 10^6$ hrn.

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