UDC 621.036.7

THE ANALYZIS OF EFFICIENCY AND OPTIMIZATION OF COMBINED DEVICE FOR THERMOUTILYZING BOILER SYSTEM

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One of the key areas of energy conservation is to improve fuel efficiency in boilers by deep waste heat of exhaust gases. Implementation of the regime of deep disposal throughout the heating season is possible in a plant comprising a boiler and a combined heat recovery system for heating several coolants. To analyze the effectiveness of the said installation and optimization in the use complex methods, which combine elements of exergy analysis of the methods of graph theory, the theory of linear systems, methods of multilevel optimization.

The purpose of research - increase the efficiency of the combined heat recovery system boiler system based on the optimization of its parameters.

Materials and methods of research. In general, a heat recovery combines en-communication systems exist between the individual coils in three types: a serial, parallel or mixed compounds of elements. The number of heat exchangers in a heat recovery system and the selection of the type of communication is defined between the need to reduce the temperature of the flue gases passing through the heat exchanger, to a predetermined value by using multiple coolants. This allows heat recovery condensing operation of steam boiler installations throughout the heating season, which provides general is elevated boiler efficiency of 13.8%.

It is interesting to find the optimal distribution of heat exchangers-ing in such a system in terms of how the required reduction temperature heating medium and minimum total exergy losses in the heat exchanger system. In the analysis of the system consisting of n heat exchangers, efficient to construct and analyze the count of exergetic losses.

Optimal distribution of the heat exchangers should ensure reduction of the flue gas temperature of 170-180 ° C to 30-40 ° C by means of heat transfer fluids, such as

water heating system feedback, additional water chemical water treatment systems, blast air and others. Total exergetic losses in the heat exchanger system should be minimal. In this paper, this requirement was monitored using the selected criteria, which includes the amount of exergy loss. As such criterion used Exergy Technology criterion proposed previously by the authors.

The results of research. With the help of this graph eksergeti-cal losses found the optimal number of heat exchangers in the system and their optimal distribution. There are two options: the first - two series-connected hot-water heat exchanger Air heating and one second - serially connected and Air heating hot water heat exchanger. Spend analysis of plant operation, including boiler and heat recovery system combined with a hot water and a heat recovery Air heating. Heat recovery system is designed to heat water and reverse thermal grid blast air boiler.

For the analysis of this installation using one of the methods of the theory of linear systems based on the RP-representation of thermodynamic balance-ray in a matrix form.

Based on RP-representation of thermodynamic balance and block diagram for the installation of the test corresponding to built the matrix by which to calculate the degree of irreversibility of processes in the installation, a comparative analysis of exergy losses of power in its various elements, to determine the relative contribution of each element in the irreversibility of the total installation.

Established. that the greatest loss of exergy occur in the power of the heat pump system. The studies make it possible to install the appropriate circuit design changes.

In accordance with the method of multi-level optimization for heat recovery installation under consideration had been divided on the optimization levels, developed a block diagram of the optimization scheme recursively levels conducted the choice of methods of constructing mathematical models, the objective functions and optimization of variable parameters for each level. Based on these studies the optimal regime and structural parameters of the combined heat recovery system (see table). Obtained through the use of multi-level optimization method for combined

heat recovery system optimal parameters can improve its efficiency by 2.5-3.0%, as compared to other methods.

Conclusions

1. Use the concepts of graph theory found the optimal number of heat exchangers in a combined heat recovery system of the boiler plant and the optimal distribution, allows the mode of deep heat recovery throughout the heating season.

2. Using the RP-representation of thermodynamic balance in a matrix form, a comparative analysis of the exergy losses of power in the various elements of the installation, including boiler and a combined heat recovery system for heating water and air blow, determined the overall performance of the installation, and the relative contribution of each element in its total irreversibility.

3. Established optimization method, a priority for combined heat recovery systems. Optimal parameters obtained for the combined heat recovery system for heating water and reverse thermal grid blast air boiler, by applying the multilevel optimization can increase its efficiency by 2.5-3.0%, compared with other methods.