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HEAT-RECOVERY TECHNOLOGIES FOR EXHAUST-GASES FROM BOILERS OF MUNICIPAL HEAT-POWER ENGINEERING

ТЕХНОЛОГИИ УТИЛИЗАЦИИ ТЕПЛОТЫ УХОДЯЩИХ ГАЗОВ КОТЛОАГРЕГАТОВ КОММУНАЛЬНОЙ ТЕПЛОЭНЕРГЕТИКИ

Summary. *Heat-recovery technologies with different types of heat-recovery exchangers of exhaust-gases of gas-fired boilers of small and medium power are proposed. Water-heating exchangers are designed to heat the return heat-network water and cold water of a chemical water-purification system, and air-heating exchangers are designed for heating with or without humidification of combustion air.*

Key words: *heat-recovery systems, increase of boiler efficiency, condensation mode, return heat-network water, combustion air, chemical water-purification system.*

Аннотация. *Предложены теплоутилизационные технологии с разным типом утилизаторов теплоты отходящих дымовых газов газопотребляющих котлов малой и средней мощности. Водогрейные теплоутилизаторы предназначены для подогрева обратной теплосетевой воды и холодной воды системы химводоочистки, а воздухогрейные для подогрева с увлажнением или без него дутьевого воздуха.*

Ключевые слова: *теплоутилизационные системы, прирост КПД котла, конденсационный режим, обратная теплосетевая вода, дутьевой воздух, система химводоочистки.*

One of the ways to increase the energy efficiency of boiler plants in municipal heat-power engineering is to use heat-recovery systems for their exhaust-gases.

At using heat-recovery technologies in boiler plants, the criterion for their thermal efficiency is usually the level of increase in efficiency or the coefficient of the use heat of fuel of boiler.

For gas-fired boilers of small and medium power which are on the balance of municipal heat-power engineering, the Institute of Engineering Thermophysics of National Academy of Sciences of Ukraine developed and proposed to introduce a package of efficient heat-recovery technologies [1-8] with different types of heat-recovery exchangers. By designation, these heat exchangers are classified into water-heating (for heating water of various needs) and air-heating (for heating with humidification or without combustion air). In addition to auxiliary equipment, a heat-recovery system may consist of one heat exchanger or a combination of several heat exchangers for heating heat-transfer agents of various purposes and thermal potential.

Water-heating heat exchangers usually heat the return heat-network water [2]. They are intended for boiler units operated during the heating period in accordance with the temperature chart of boiler plant. In some operating modes of these heat exchangers, deep exhaust-gas cooling occurs, which is accompanied by condensation of part of the water vapor contained in the gases. Because of this, the heat exchange part of these heat exchangers is made of corrosion-resistant bimetallic pipes [6, Fig. 2.2, P. 43]. The increase in boiler efficiency due to the operation of these heat exchangers is 3.0...6.0%. A lower value of the range corresponds to the operation modes of the boiler when heating the return heat-network water with a temperature of more than 50 °C, at which there is no condensation mode in the heat exchanger. Also, water-heating heat exchangers can pre-heat cold raw water before it enters the chemical water-purification system. But the technologically permissible temperature level for

heating this water cannot exceed 40 °C, and the consuption of this heat-transfer agent is limited by the need to recharge the heating system. Therefore, despite the provision of the condensation mode of operation of this heat exchanger due to the relatively low initial temperature of raw water, the increase of coefficient of the use heat of fuel of boiler during its use does not exceed 2%.

Achieving greater efficiency of heat-recovery systems is possible due to the combination of several water-heating heat exchangers [3], installing them behind the boiler in decreasing order the initial temperature of the heated water. Due to the combined use of recovered heat, the coefficient of the use heat of fuel of boiler is increased by 4.5...8.0%.

Heat-recovery exchangers in which heating of combustion air is realized are placed directly behind the boiler, or are installed in complex systems after the water-heating heat exchanger along the exhaust-gas [4, 5], which ensures an increase the coefficient of the use heat of fuel of boiler by 5.0...10.0%. The recovered heat can also be used to moisten this air [6; 8], due to which an additional ecological effect is achieved. As is known, humidified air inhibits the formation of nitrogen oxides in the boiler furnace due to a decrease in the combustion temperature of the gas-air composition [6, P. 146-148]. The increase of coefficient of the use heat of fuel of boiler during the introduction of heat exchangers for heating and humidifying combustion air is 8.0 ... 11.0%.

The payback period for the implementation of the proposed heat-recovery systems for municipal boiler plants does not exceed 3 years.

The use of the proposed heat-recovery systems for heating boiler plants provides an increase in the efficiency of the boiler or its coefficient of the use heat of fuel by 3...11%, depending on the type of equipment used and the need for recovered heat

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