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METHODS FOR PROTECTING BOILER CHIMNEYS AGAINST CORROSION DUE TO FALL-OUT CONDENSATE FROM FLUE GASES

МЕТОДЫ ЗАЩИТЫ ДЫМОВЫХ ТРУБ КОТЕЛЬНЫХ ОТ КОРРОЗИИ ВСЛЕДСТВИЕ ВЫПАДЕНИЯ КОНДЕНСАТА ИЗ ДЫМОВЫХ ГАЗОВ

Summary. *The application of thermal methods for protection of chimneys of boiler units with deep heat-recovery systems of exhaust-gases was proposed. The results of the research have confirmed the high efficiency of these methods.*

Key words: *condensation formation, bypass, condensation mode, admixture of air, exhaust-gas heater, thermal insulation.*

Аннотация. *Предложено применение тепловых методов защиты дымовых труб котельных установок с системами глубокой утилизации теплоты отходящих газов. Результаты исследований подтвердили высокую эффективность использования этих методов.*

Ключевые слова: *конденсатообразование, байпасирование, подмешивание воздуха, газоподогреватель, теплоизоляция.*

Chimneys are one of the important technological elements of gas-consuming boiler houses. Their operation must ensure strict environmental requirements for compliance with the regulatory indicators for the dispersion of harmful substances contained in the flue gases of boilers. Therefore, high

requirements are imposed on chimneys with regard to their reliability and durability.

An effective way of increasing the safety of operation of chimneys of boiler plants is the use of systems for thermal protection of their exhaust-gas ducts from condensation. Condensation leads to corrosive destruction of these ducts and therefore is considered a braking factor for widespread introduction of heat-recovery technologies in boiler plants with deep cooling of boiler exhaust-gases and using the heat of condensation of water vapor contained in gases [1; 2].

Various measures are used for anticorrosive protection of chimneys. These are measures to improve the anticorrosive properties of the carcasses of gas ducts and chimneys, as well as measures related to the creation of a heat and humidity environment on the inner surface of the gas exhaust ducts, preventing condensation formation on their surfaces. As for the second class of measures, these include the use of methods for preventing condensation by: heating the walls of chimneys, arranging ventilated channels, increasing the thermal insulation properties of chimney's carcasses when implementing internal or external thermal insulation, and other methods.

Other effective methods belonging to the second class of protection of gas exhaust ducts of boiler plants with deep cooling of flue gases include thermal methods for preventing condensation in these ducts [3-5]. Among them, the methods associated with a change in the thermal and humidity characteristics of flue gases after heat-recovery stand out - partial bypassing of boiler exhaust-gases past heat-recovery equipment (heat-recovery exchangers), mixing the flue gases after the specified equipment with the flue-gases heated air in heater of boiler house, or drying cooled gases by heating them in heat exchangers-gas heaters installed behind the heat-recovery exchangers. These methods, obviously, can be implemented only in the presence of heat recovery systems with deep cooling of flue gases.

An analysis of experience with chimney operation when using heat-recovery systems in boiler plants has shown that the use of methods involving changes in the thermal and moisture characteristics of cooled flue gases is quite effective for chimneys with high thermal insulation properties of the carcass (brick, reinforced concrete or metal with linings or other thermal insulation).

Chimneys with low thermal insulation properties of the carcass (metal, reinforced concrete without lining, etc.) when using heat-recovery technologies to reduce heat losses to the environment need to strengthen the thermal protection of the carcass [5]. Thermal insulation can be internal, e.g. lining with bricks, or external - by applying a layer of insulating material outside the chimney carcass. As an effective means of internal thermal insulation of chimneys, the insertion of smaller diameter gas discharge ducts to create an air gap between the chimney carcass and the chimney duct can be considered.

At the Institute of Technical Thermophysics of National Academy of Sciences of Ukraine a set of researches on efficiency of application of the mentioned thermal methods of protection of chimneys of boiler units with systems of deep heat-recovery of flue gases was carried out. Results of researches confirmed high efficiency of application of these methods [3-5]. And the increase of operational reliability of chimneys contributes, as it was noted, to ecological safety of boiler-houses.

Besides ensuring environmental reliability of boiler plants by anticorrosion protection of chimneys, heat recovery systems developed in Institute of Technical Thermophysics [6; 7] are characterized by additional environmental effects, namely reduction of harmful emissions into environment by decrease of fuel consumption by 4-10 % and partial dissolution of nitrogen and carbon oxides in generated condensate; decrease up to 50% of NO_X formation in the boiler furnace by humidifying the combustion air; and possibility of beneficial use of condensate formed in the heat-recovery system for make-up of heating networks (45 - 115 kg / h per 1 MW of boiler heating

capacity). This circumstance ensures the reduction of consumption of natural water resources in heat supply systems.

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