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EFFECTIVE TECHNOLOGY FOR THE PROTECTION OF THE EXHAUST DUCTS AND CHIMNEY FROM CONDENSATION

During gas-fired heating and heat-industrial boiler installations operation in modes close to nominal, the work of exhaust ducts without condensate formation inside a chimney is provided. Decrease of loading of boiler installation, i.e. decrease of exhaust-gases temperature and decrease of speed of their moving in a chimney, causes increase of relative humidity of gases and danger of condensate formation. The decrease of boiler installation loading up to a critical level, when the gases are cooled up to temperature below than dew-point of water pair, results in separation of a condensate from exhaust-gases, that create the appropriate problems of reliable and safe operation of boiler installation. Also, the condensation mode may occur as a result of the use of heat recovery technologies. Especially critical situation is formed in the winter operation period.

It is possible to prevent condensate formation in a chimney by two ways: first - by increase of exhaust-gases temperature and second – by decrease of temperature of a dew-point, that is achieved by the appropriate decrease of exhaust-gases temperature, condensate formation and its removal from exhaust ducts [1, 2]. At the same time temperature of a dew-point for exhaust-gases after cooling (the secondary dew-point) will be lower under 15-20°C smaller, than temperature of a dew-point for this gases before cooling (primary dew-point). As the exhaust-gases after cooling are in a condition close to saturation, they

must be heating. Taking into account, that owing to decrease of a temperature difference between of gases and outside air, an internal surface temperature of chimney wall changes less intensively, than temperature of a dew-point, necessary heating of exhaust-gases turn out to be smaller in comparison with exhaust-gases heating without preliminary cooling.

The principle of offered technology of thermal protection exhaust ducts of boiler installations consists in combination of forced high decrease of temperature of a dew-point of water pair contained in exhaust-gases, with the subsequent increase of exhaust-gases temperature. Means of protection are appropriate heat engineering systems, due to which functioning the realization of technology is carried out. The main elements of such systems include surface or contact type gas coolers and surface type exhaust-gas heaters [3-5]. According to the proposed technology, a schematic circuit of the thermal protection system of the exhaust duct of the boiler plant with a heat-recovery installation with draining unit has been developed.

The technology provides at least two-step high cooling of exhaust-gases from boiler installation down to temperature under of a primary dew-point on 25-30°C and subsequent heating the exhaust-gases up to temperature, at which will be provided the absence condensate formation in a exhaust ducts inclusive the chimney output. Minimal temperature of gases heating is defined by account and depends on the characteristics of exhaust duct (in particular of a chimney) and external factors, i.e. on intensity of gases cooling in exhaust duct after exhaust-gas heater.

Deep cooling of the exhaust-gases in front of the exhaust-gas heater is accompanied by a corresponding release and removal of condensate from the exhaust-gas stream, as a result of which the moisture content of this gases and the temperature of the secondary dew point are sharply reduced. As cooling heat-transfer agent recommended used cold combustion air.

There is a favorable dependence between temperature of outside air and necessary decrease of moisture content of exhaust-gases before exhaust-gas heater. In the time of the environmental temperature (in the winter period) decreases, exhaust-gases cooling increases and them moisture content before exhaust-gas heater decreases. In the time of the environmental temperature (in the summer period) increases, gases cooling naturally decreases and simultaneously possibility of condensate formation in the exhaust duct after exhaust-gas heater decreases, hence, the necessity of high cooling of exhaust-gases decreases.

Conclusions. A progressive technology is proposed to prevent the formation of condensate inside the exhaust ducts and in the chimney due to the introduction of the complex heat-recovery system. The effect is achieved due to the deep cooling of the exhaust-gases in the heat-recovery equipment by heating several heat-transfer agents with different thermal potentials by the heat of the exhaust-gases and subsequent heating of the dried exhaust-gases in a special unit of heat-recovery installation.

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