POWER EFFICIENCY OF THE "WET" COMBUSTION AND POLLUTANTS FORMATION REDUCTION

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The role and place of water vapor in power engineering – by combustion processes have been considered with the purpose of reduction the effluents of nitrogen oxides and carbon oxide.

The problem of interconnection the principal characteristics of Earth climate, combustion process and fuel utilization efficiency has been considered.

Atmospheric (free) air serving as an oxidizer in combustion processes is differed by inner availability the water vapor. Absolute content of water vapor is defined by an air temperature and its relative humidity.

Humidity impact of atmospheric air on fuel principal heat engineering (power) characteristics has been investigated, namely regarding the theoretical combustion temperature, as well as of low and high combustion value. Reduction of each of mentioned characteristics by growth of air water vapor content has been proved.

The thermodynamic analysis of dependence the efficiency of fuel utilization on combustion air parameters has been carried out by varying its temperature and humidity. It has been stated for the first time that an air preheating till 373 K ensuring monotonous enhancement of efficiency and fuel consumption reduction in case of dry combustion air, causes the efficiency lowering in case of wet combustion air (oxidizer). Negative influence of combustion air humidification is increased by rise the air temperature and humidity – up to air saturation (dew point reach).

The methodology of evaluation the nitrogen oxides formation in dependence on moisture content of burning mixture has been proposed as well. The results of measurements have been used for verification the calculation data. Coincidence of relative change the NO (NO_x) issue due humidification the combustion air revealed by means of CFD prediction and as the tests' data processing have confirmed the qualitative and the quantitative correspondence of physical and chemical kinetics mechanisms and the CFD modeling procedures with the processes to be studied.

It has been proved the substantial, greater by value than by order reduction of NO effluents and simultaneously lowering of CO concentration near two times under conditions of the methane-air mixture burning and the combustion air humidification up to saturation state under an air temperature of 325 K.