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ENERGY EFFICIENCY OF THERMOCHEMICAL PREPARATION \ OF SOLID FUEL FOR BURNING

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In heat-and-power engineering black oil and natural gas are used for low-grade coal ignition and flame stabilisation, but it does not solve the problem. Their co-combustion with coal decreases the main indexes of Thermal Power Plants (TPP) (boilers' efficiency decreases, dust and gaseous pollutant emissions increase, high temperature corrosion of boiler's heating surface increases, etc.).

The first step in realisation of this technical solution is a method of thermochemical preparation of coal to burning workable by authors. The development of this method is in good progress now. In this method coal dust flow sent to boiler furnace is pided in two parts. One part is heated by electroarc plasma to the temperature of near complete volatile coal emission and partial gasification of the coke residue. It is done to provide total emission of fuel gases to be at the same volatile level of the content in high-grade coals, which are able to ignite and burn without stabilisation by black oil (mazut) or natural gas. Thus high-reactive two-component fuel (fuel gas + coke residue) is obtained from the part of air-fuel mixture that passes through the arc zone. It can be ignited during mixing with the residual part of the air-fuel mixture and thus stabilise the combustion process. This method is successfully used in a number of TPPs in Kazakhstan, Russia, Ukraine, Mongolia, China, Korea and Slovakia [1].

Efficiency of thermochemical preparation of fuel for combustilon (TCPT), underlying the plasma ignition of coals supported by electric arc plasma. Partial removal of volatile gases and partial gasification of the coke residue in order to provide a quantitative yield of combustible gases at the level of volatiles in highly reactive coals that can ignite and sustainably burn without fuel oil illumination. Coal + air, which have passed the arc-discharge zone, receive a high-reactive two-component fuel (combustible gas + coke residue), which can ignite when mixed with the main stream of the air mixture and stabilize the combustion process (regardless of the quality of the corresponding coal) [2].

The proportion of the air mixture required for TCPT is determined from the heat balance equation in such a way that the heat released during the combustion of the resulting two-component fuel in conjunction with the plasma energy was sufficient to heat the main air flow of the air mixture to the ignition temperature.

At the same time, it is very important to maintain efficiency, so that TCPT and mixing its products, i.e. A highly reactive two-component fuel, with the main flow of the air mixture, was carried out before reaching the furnace space and beginning mixing with secondary air [3-4].

The most effective is the increase in the reactivity of the whole pulverized-coal stream at the expense of plasma activation of its smaller part in the volume of the burner device while providing necessary time of fuel stay in it.

Thus, it can be concluded that the energy efficiency of plasma processes ignition, thermochemical preparation and gasification of coals is much higher than that of traditional fire methods.

References

1. Petrov S.V., Saakov A.G. Plasma – catalyst of combustion of low-reactive coals// 16th International Symposium on Plasma Chemistry. Taormina-Italy. June 21-27, 2003. P. 346-356.

2. Karpenko E.I., Messerle V.E., Ustimenko A.B. Plasma-Aided Solid Fuel Combustion // Proceedings of the Combustion Institute, 2007, V.31, Part II, P.3353-3360.

3. Askarova A.S., Karpenko E.I., Lavrishcheva Y.I., Messerle V.E., Ustimenko A.B. Plasma-Supported Coal Combustion in Boiler Furnace // IEEE Transactions on Plasma Science. 2007-Dec. Vol. 35, Issue 6, P.1607 – 1616.

4. Messerle V. E., Mosse, A. L., Ustimenko, A. B.Plasma gasification of carbonaceous wastes. Journal of Thomson Reuters, 2016, 23 (4), 613-620.