

# THE INVESTIGATION OF THE INFLUENCE OF THE AIR FLOW SWIRL IN THE BOILER BURNER SYSTEM ON THE THERMO-GAS DYNAMICS OF THE FIRE SPACE OF THE BOILER FURNACE AND THE FORMATION OF NITROGEN OXIDES IN THE ACTIVE COMBUSTION ZONE

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**The aim of the work** was to investigate the influence of the secondary air stream swirl in the two layers burners system on the ecological characteristics of the boiler.

The computer model of the furnace interior of the TPP 312 boiler was build. A separate investigation of the hydrodynamics of swirling stream in the model of the TPP 312 boiler burner with different number of blades for the secondary air swirling was made. In the model of the burner used axial blades with a flow turning angle of 57 degrees. The results of simulations of the velocity fields at the end of the burner were used to determine the boundary conditions for simulating the fire space of the boiler furnace.

A numerical simulation of the coal combustion process in a boilers' model was carried out, the influence of the swirling and its direction on the thermo-gas dynamics of the boiler furnace and the formation of nitrogen oxides process in the active combustion zone were determined. The direction of the secondary air swirl was chosen in such way that it does not interfere with the burner on the opposite side of the boiler. The influences of the secondary air stream swirl on the ecological characteristics of the boiler are given in the table.

*Table - The influences of the secondary air stream swirl on the formation of nitric oxide*

Number of blades	Swirl number		NO, kg/s
	$S_1$	$S_2$	
0	0,596	0,205	0,2939
8	0,58	0,813	0,2778
24	0,497	1,197	0,273

## **Conclusion**

The results of the study showed that for TPP 312 boiler running on bituminous coal:

- the organization of the secondary air stream swirl allows to reaches the reduction of nitrogen oxides to 9%;
- the use of more than 8 blades for the secondary air swirl is not rational, since it does not lead to a significant reduction in nitrogen oxides, but leads to an increase in the hydraulic resistance of the burner.