Abstract

The increasing application of renewable energy sources in the global energy sector with the combination of the development of low-emission combustion techniques has resulted in significant changes in the operation of existing power units fired with pulverized coal. The efficiency of a pulverized coal-fired boiler is reduced when energy from renewable energy sources is available. Therefore, the amount of drying, hot air supplied to the mill is reduced. In combination with low-emission combustion techniques that limit the amount of air supplied to the boiler, a situation may occur in which the ability of the medium stream to carry particles from the grinding zone of the mill will be insufficient. The element that shapes the speed and profile of the air flow supplied to the mill is the nozzle ring. Within the scope of this project, three research methods were used to look at the issue of drying and transport air flow through the nozzle ring in greater accuracy than before. Namely, flow research, laboratory research and CFD research were carried out into the flow of drying and transport air through the nozzle ring. Moreover, this research gives the observation that the medium of the flow through the nozzle ring is characterized by the highest share of pressure losses in relation to total pressure losses, which are resulted by the flow of the medium through the mill and other conclusions were demonstrated. The data obtained from flow and laboratory research were statement input data to prepare *CFD* model of the nozzle ring on an industrial scale. The influence of the selected parameters on the outcome of the objective function, which is to minimize the resistance to air flow through the nozzle ring and to achieve a uniform distribution of the pulver-air mixture around the perimeter of the mill elements, was also determined. Moreover, reducing the pressure loses by medium flow through the nozzle ring could be a way to increase the dynamics of the mill's operation, which is required under the current assumptions of conventional power plants, that is with a high share of power from renewable sources in the National Power System with a relatively low power load on a conventional power unit. In addition, the design under development is to enable the maintenance of the optimal ability to remove dust particles in a wide range of mill ventilation and to reduce the number of overfills, especially with a relatively low load of the mill, which is important not only for mills operated in the power engineering sector but also for mills operated in the industrial sector to.