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OPTIMIZATION OF COAL BLEND COMPOSITION AND COKING CONDITIONS AT THE COKE PLANT OF PJSC "ARCELORMITTAL KRYVYI RIH" UNDER CONDITIONS OF RAW MATERIAL BASE CHANGES AND MARTIAL LAW IN UKRAINE

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Coke production under conditions of changing supply structure of coking coals requires the development of rational coal blend compositions capable of ensuring stable production of metallurgical coke with the required quality characteristics. The aim of this study was to determine the influence of coal blend composition and preparation parameters on blend technological properties, tamping process efficiency, coke quality, and yield of by-products of coking for the operating conditions of the coke plant of PJSC "ArcelorMittal Kryvyi Rih".
The paper presents the results of studying the effect of coal blend composition and preparation parameters on the efficiency of the coking process and the quality of the produced metallurgical coke under industrial conditions of the coke plant of PJSC "ArcelorMittal Kryvyi Rih". The research was carried out considering current industrial challenges associated with changes in the raw material base, limited availability of high-quality coking coals, and the necessity of maintaining stable operation of the enterprise under martial law conditions in Ukraine.
Real coal concentrates of different rank compositions were investigated, and the regularities of the influence of their petrographic, technological, and size characteristics on the formation of tamped coal blends and coke properties were established. It was found that an increase in the proportion of low-rank gas coal is accompanied by a decrease in coke yield, deterioration of mechanical properties, and an increase in coke reactivity. It was demonstrated that the application of tamped coal blends provides increased charging density and formation of coke with improved CRI/CSR characteristics. The most favorable combination of coke quality and blend technological properties was obtained for the second blend composition, for which the CRI values were 30.0–32.7 %, and the CSR value was approximately 60 %.
It was demonstrated that optimization of the coal blend composition enables more efficient utilization of available coal resources without significant deterioration of metallurgical coke quality. The obtained results can be used for selecting industrial coal blend compositions and preparing industrial-scale trials in coke production.
The influence of coal blend crushing degree on energy consumption during tamping and formation of coal cake density was established. The obtained results correspond to modern approaches to optimization of tamped coal blend preparation and confirm the necessity of comprehensive consideration of coal quality and technological parameters of its preparation.
The practical significance of the study consists in determining a rational coal blend composition for the conditions of the coke plant of PJSC "ArcelorMittal Kryvyi Rih", which enables stable production of metallurgical coke under changing coal supply conditions. The research results can be applied for further improvement of coal blend preparation technology, including the use of modern technological additives and methods for regulating the caking properties of coal mixtures.

Keywords: coal blend; coking; metallurgical coke; coke plant of PJSC “ArcelorMittal Kryvyi Rih”; coal blend tamping; raw material base; coke quality; petrographic composition; size composition; martial law.

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