# RESEARCH OF THE INFLUENCE OF VOLATILE SUBSTANCES OUTPUT PER DRY MASS OF COAL BLEND ON THE OUTPUT OF COKING PRODUCTS AND SPECIFIC HEAT CONSUMPTION FOR COKING

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To conduct the research based on an adequate linear model of the coking process in modern coke ovens a program was developed by PascalABC to calculate the material and heat balances of coking 1000 kg of coal blend and the material balance of coke oven gas burning. The mathematical model uses two main indicators of coal blend quality to calculate coking product outputs: volatile substances output per dry mass $V_{bl}^d$ and sulfur content per dry mass $S_{bl}^d$. As initial data we took the averaged data for coke ovens of the system of paired verticals with recirculation. The indicator $V_{bl}^d$ in the program was varied in a wide range from 27 to 33 % to fully evaluate its influence. The results of the calculations are presented in Table 1.

Table 1. Dependence of coking parameters on the output of volatile substances per dry mass of the coal blend

| $V_{bl}^d$, % | $q^r$, kJ/kg | $G_c$, kg | $G_{d.g}$, kg | $G_{res}$, kg | $G_{b.h}$, kg | $G_{NH_3}$, kg | $G_{H_2S}$, kg | $G_{p.w}$, kg |
|---|---|---|---|---|---|---|---|---|
| 27,0 | 2853 | 691,8 | 133,5 | 32,2 | 10,6 | 2,98 | 3,67 | 25,3 |
| 27,5 | 2855 | 687,9 | 136,0 | 32,8 | 10,8 | 3,04 | 3,67 | 25,8 |
| 28,0 | 2858 | 684,0 | 138,5 | 33,4 | 11,0 | 3,10 | 3,67 | 26,3 |
| 28,5 | 2861 | 680,2 | 141,0 | 34,1 | 11,2 | 3,15 | 3,67 | 26,7 |
| 29,0 | 2863 | 676,3 | 143,5 | 34,7 | 11,4 | 3,21 | 3,67 | 27,2 |
| 29,5 | 2866 | 672,5 | 146,0 | 35,3 | 11,6 | 3,27 | 3,67 | 27,7 |
| 30,0 | 2868 | 668,6 | 148,5 | 35,9 | 11,8 | 3,32 | 3,67 | 28,2 |
| 30,5 | 2871 | 664,8 | 151,1 | 36,5 | 12,0 | 3,38 | 3,67 | 28,6 |
| 31,0 | 2874 | 660,9 | 153,6 | 37,1 | 12,2 | 3,43 | 3,67 | 29,1 |
| 31,5 | 2876 | 657,0 | 156,1 | 37,7 | 12,4 | 3,49 | 3,67 | 29,6 |
| 32,0 | 2879 | 653,2 | 158,6 | 38,3 | 12,6 | 3,55 | 3,67 | 30,1 |
| 32,5 | 2882 | 649,3 | 161,1 | 38,9 | 12,8 | 3,60 | 3,67 | 30,6 |
| 33,0 | 2884 | 645,5 | 163,6 | 39,5 | 13,0 | 3,66 | 3,67 | 31,0 |

The increase in the output of volatile substances per dry mass of the blend from 27 to 33 % leads to an increase in the specific heat consumption for coking 1 kg of wet blend by 31,5 kJ/kg (1,1 %), a significant decrease in coke output by 6,7 %. But this is partially offset by a 23 % increase in the output of other coking products: dry coke oven gas, resin, benzene hydrocarbons, ammonia, and pyrogenetic water. The output of hydrogen sulfide does not change.

In summary, if the coal blend of the current composition ensures the production of high-quality coke with high mechanical properties under the selected coking mode, it is necessary to prevent changes in its grade composition or replacement of suppliers of concentrates of certain coal grades with others if this leads to an increase in the output of volatile substances from the blend. Such changes will lead to significant economic losses.