

METHOD TO REDUCE FREEZING AND IMPROVE DUST SUPPRESSION
 WHEN RECEIVING AND TRANSPORTING PETCOKE

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The paper describes a method for reducing the freezing point and for improving dust suppression when receiving and transporting petroleum coke, which consists of its refinement using the proposed remedy from residual refined products.

Petroleum coke (petcoke) is a solid product of the refining process. Many products are derived from a barrel of crude oil (e.g. gasoline and diesel) and petcoke is one of those products. Petcoke is a valued commodity around the world and there has been a global market for petcoke for decades. Fuel grade petcoke is an essential fuel that is used in industrial applications and manufacturing processes including the production of steel, aluminum, and other specialty products. Application of anti-dust chemical agents is normally achieved by combining the chemical into the water spray. The surfactant enhances the wetting by lowering the surface tension of the water thereby allowing the water droplets to penetrate deeper into the petcoke [1].

The use of anti-dust chemical agents may offer the following benefits: have a residual effect of up to 45 days or more for pile integrity, depending on weather conditions and type of chemical used; minimize need for reapplication of water; allow additional coke pile height, if needed; routine cleanup requirements for the coke conveyors may be reduced; maintenance needs within the coke handling facilities may be reduced.

The fight against dust generation during the receipt and transportation of petcoke and the reduction of coke freezing at negative air temperatures is an important task for the Belarusian oil refinery [2-7]. Dusty air can cause emergency situations. A person's prolonged stay in a dusty atmosphere causes occupational pulmonary diseases.

Task formulation - to develop means against freezing, sticking, for dust suppression and reduction of losses from blowing petcoke and coal, during their transportation in conditions of negative temperatures.

The input analysis of raw materials was performed in the laboratory of the Department of Technology and Equipment of Oil and Gas Processing. Compounding of light vacuum gas oil with high-molecular oil residues was performed on a laboratory setup. For the obtained prophylactic agents assumed viscosity at 50 °C (GOST 6258), pour point (GOST 20287), flash point (GOST 6356), determination of water content (GOST 2477), determination mechanical admixtures (GOST 6370) and copper strip test (GOST 6321) were determined.

A prophylactic agent for dust suppression and reducing losses from blowing petcoke upon receipt, as well as against the freezing of coke, sticking during transportation at negative temperatures has been developed on the basis of residual refined products. The process of freezing and sticking to the surface of the gondola cars when watering coal and applying anti-freezing agent is simulated at a temperature of minus 25 °C. The sequence of modeling the process of freezing and sticking of coal to the walls of gondola cars using "Sample 1" is shown in Figure 1.

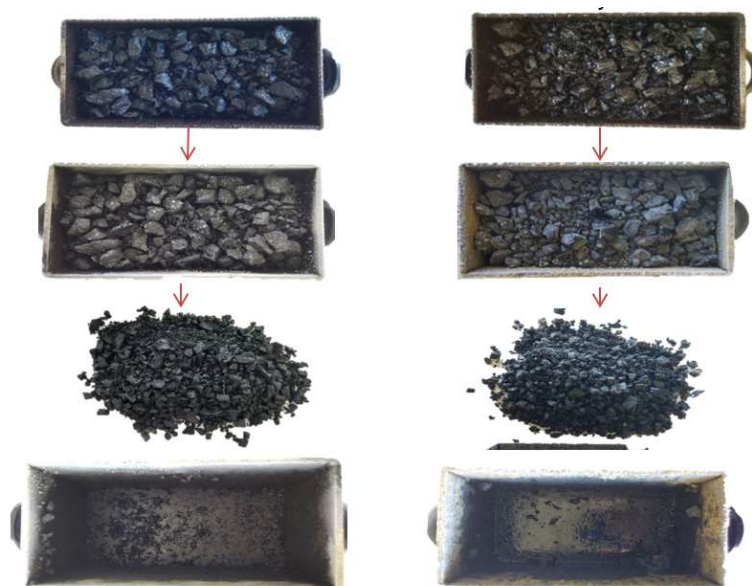


Figure 1. – The sequence of modeling the process of freezing and sticking of coal to the walls of gondola cars

Comparison of technical and economic indicators of the proposed samples obtained from various petroleum residues (sample 1 and 2) with the industrial analogue are given in table 1.

Table 1. – Technical and economic indicators of prophylactic agents

Indicators	Niogrin PS-35S TC 0258-002-38507925-2012	Offered prophylactic agents	
		sample 1	sample 2
Assumed viscosity at 50°C, GOST 6258, °AV	within 1,0 – 3,0	1,12	1,11
Pour point, GOST 20287, °C	not higher minus 35	lower minus 65	lower minus 65
Flash point, GOST 6356, °C	not lower 40	70	70
Determination of water content, GOST 2477, % of the mass	no more 2,0	0,01	0,01
determination mechanical admixtures, GOST 6370, % of the mass	no more 1,0	trace	trace
Copper strip test, (GOST 6321	stands		
Cost \$ / ton	180–200	55	54

It is established that the proposed prophylactic agents do not exhibit corrosion aggressiveness with respect to metal surfaces, do not contain mechanical impurities and water. Samples have sufficiently high flash points that meet fire safety requirements. Also samples are characterized by low pour points allowing them to be used at ambient temperatures below minus 40 °C. The proposed samples are not inferior in performance properties to the analogue "Niogrin-PS 35S" and more than three times cheaper. Prophylactic agents can be effectively used as prophylactic agents against freezing, sticking, for dust suppression and reducing losses from blowing petroleum coke and coal.

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