

THE RECEPTION OF GRANULATED FUEL AND BRIQUETTES FROM COALCONTAINING WASTE

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Introduction

Large quantities of slags, slimes, silts and flotation waste contained to 50 % and higher of organic matter are formed during coal extraction and enrichment. However the part of using of these valuable waste is not higher than 2 % from common yield in Ukraine in consequence of high humidity and impossibility of waste transportation. At present the valuable and economical expedient technologies of waste processing are absent in Ukraine.

The goal of research is to create the powersaving technology of granulated fuel and briquettes reception from coalcontaining waste.

Experimental

Complex investigations of coal slimes, silts and flotation waste of 15 large coal associations and 17 enrichment plants of Ukraine have been carried out. The qualitative-quantitative and chemical-technical waste characteristics have been determined. The methods of investigation as derivatography, X-ray phase analysis, determination of waste ability to flotation, durability and water-resistance of granules and briquettes have been used.

Results And Discussion

The obtained data analysis shows that on ash content index coalcontaining waste could be divided on three groups.

The first group is the waste with ash content $\leq 45\%$. The main directions of these waste using are burning, gasification, enrichment, coke production. Waste of the second group have ash content 45-60% and are used for burning, gasification, enrichment, burnt building materials production. Waste of third group has ash content $>60\%$ and are used for gasification, enrichment, burnt building materials production.

It has been found by optical method that the main waste component (40-60%) is the substance of caolinical or hydromical composition. Quartz (3-15%), pyrite (1 -

4 %) and calcite (1-3 %) are detected in small quantities. The coal substance content in waste is 18-35 %.

Coal component in waste is distributed irregularly. As we see from the Table 1, the main part of carbon and sulphur is concentrated in waste fraction larger than 0,2 mm. The content of this group in different waste is 45 - 30 % at medium index of ash content 16,45 %. The yield of fraction with particles size less than 0,2 mm is from 60 to 86 % at the ash content 87 %. In the divided on density fractions of flotation waste the coal component is distributed in next way : the yield of waste fraction with density $< 1500 \text{ kg/m}^3$ is 1-6 % at the ash content 8-16 %, fraction with density 1500-1800 kg/m^3 is 2-7 % at the ash content 17-30 %, fraction with density 1800 kg/m^3 is 65-90 % at the ash content 65-81 %. By the waste enrichment we can receive the low-ash and high-ash product for using on appointment. It was confirmed by experiments on flotational separation of waste at different parameters of flotation.

The concentrated product with carbon content 34,0-42,5 % could be used as a fuel for burning or gasification. Ashed product of waste flotation with carbon content 8,0-15,3 % could be expediently used as addition in production of ceramic makes, cement and in the capacity of raw material for reception of brick and porous aggregates. The number of waste plasticity is not low and consists 7-12. However these waste are viscous, stringy, sticky and hard-processing material in consequence of long staying in water and influence of atmosphere.

The technology of reception of granulated fuel and briquettes from flotation waste which belong to the first group on the ash content index has been elaborated. It includes the operation on loosening of raw material, drying and granulation on rotatory surface or briquetting of dry product.

The influence of granulated charge composition, drying temperature and time on the physical-mechanical characteristics of granulated product has been studied. The durability at compression, shedding, attrition in drum, water-resistance and water-absorption have been determined. The results show that granules durability and water-resistance increase with thermal temperature

increasing. The addition of surface-active substance as sulphite-alcoholic malt-residue is allowed to receive the more qualitative granules at the more low temperatures.

For briquettes making the complex binder from sulphite-alcoholic malt-residue and slaked to the hydrated condition lime was used. The modified organic binder on the base of coal resin was tested too. The briquettes obtained with different binders are characterized considerably high physical-mechanical properties and could be used as the fuel in power plants of large and low capacity.

The technological process of reception of granulated fuel and briquettes from flotation waste have been developed.

Slime from storages is dried in natural conditions, than raw material is directed to loosening and to camera of drying drum. In drum the special nozzles ensure the loosening of waste, intensification of drying and reception of dry product of needed granulometric composition. Than dry product goes to drum granulator for reception of granules (their size is not higher than 10 mm) and treatment by the hydrophobic liquid with the aim of granules water-resistance increasing. Hydrophobical granulated product is directed to enterprises-consumers. The dry product is represented enough durable granules resistant to transport loads and influence of atmosphere.

Table. The dependent of carbon and sulphur content from particles size of flotation waste

Particle size, mm	Yield, %	Carbon content, %	Sulphur content, %
1,0	4,84	70,75	2,75
1,0-0,5	2,60	57,94	2,52
0,5-0,3	2,73	36,04	2,39
0,3-0,2	4,01	32,12	1,62
0,2-0,1	14,66	28,99	1,27
0,1-0,063	10,31	9,34	2,74
0,063	60,85	7,98	1,98

For reception of briquettes the dry product is directed to special mixer (where it is mixed with organic binder) and than to the roller press for briquetting. The smoke gas from dried waste burning in fluidized bed at the temperature 800-950 °C is used as heat-transfer agent. The external air is added to smoke gases for their cooling to needed temperature of drying.

Conclusions

Complex investigations of coal flotation waste properties have been carried out.

The powersaving technology of granulated fuel and briquettes reception from coalcontaining waste and the working project of installation have been created. The productivity of installation is 50 t/h by granulated fuel and 15 t/h by briquettes.

The introduction of technology will allow to increase considerably the volume of coal flotation waste utilization in energetics, by-product coke industry and building materials production, to reduce essentially the negative influence of waste storages on the ecological situation.