TECHNOLOGY OF LOWERING OF WASTES OF OXIDES OF NITROGEN AND SULPHUR AT INCINERATION OF HIGH ASHEN COAL AND COAL REFINING WASTES

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Abstract

Has been explored the influence of getting technology of high concentrated suspensions and their reological characteristics, granulametrical composition and electro-kinetic quality of the parts of the dispansion's phase. Has been determined optimal technological mode of operation in getting high concentrated suspensions on the base of wastes and has been shown ecological and economic expediency of their use as secondary power vehicle. Has been shown that in the time of throwing out basic pollution substances in the time of burning down high ashen coal in the shape of high concentrated suspensions are reduced on 25-30%

Introduction

Burning down different solid fuel is one of the main sources of polluting the environment (atmosphere the first). In the time of burning down solid fuel alongside with oxides of basic fuel element - carbon and hydrogen, in an atmosphere are coming through ash with the parts, that hasn't burned,oxids of sulfur(IV) and sulfur(VI), oxides of nitrogen and several of fluoro-chemicals, and also gaseous products of incomplete combustion of fuel. Most these components belong to the number of toxic, that even in it is comparative low concentrations have harmful influence on nature and man.

Working mass of fuel of organic origin consists of carbon **C**, hydrogen **H**, oxygen **O**, nitrogen **N**, sulphurs **S**, moisture and ash. As a result of process of complete combustion in an air environment in smokes gases carbon dioxide CO_2, formed aquatic pair, nitrogen. sulphur, in the shape of oxides SO_2 and SO_3 (sulphurik anhydride) and volatile ash. From the transferred constituents of products of complete combustion the oxides of sulphur, nitrogen and ashes to the number of harmful. The volatile ash of some fuels, except for untoxic constituents. contains harmful admixtures. Yes, there is an arsenic in the ash of the Donetsk's anthracites, in the ash of

Eribasty's coal is free silex, in the ash of Canscas's and Achinsk's coal and are the other types of mineral solid fuel are free kemidol [1].

For the last decades it began to be anymore spared attention to the decline of maintenance of oxides of nitrogen, which appear from nitrogen of air in the process of combustion of fuel. Began to give the special value to this question after introduction of requirement about the account of the total influencing of SO_2 and oxides of nitrogen.

It should be noted that some harmful components of smokes gases are specific for those or other fuels. Yes, the fluoro chemicals can appear at incineration of some solid fuels. At combustion of fuel oil in an atmosphere connections of vanadium and salt of sodium act additionally. Carbon dioxide does not behave to the toxic matters, however influences on the common state of circumterestrial atmosphere (hotbed effect) [1].

A situation is considerably complicated, if the process of burning flows not fully and there are the products of incomplete combustion in smokes gases. By the basic product of incomplete combustion in heating of generators there is the oxide of carbon of CO is smeech gas. In addition, in smokes gases at incomplete combustion there can be different hydrocarbons and other.

Most thermal station of Ukraine use a solid fuel, mainly anthracitic selection, lean coal high ashen wastes. At the same time, from the ecological point of view of coal, above all things with considerable maintenance of ash is the most dirty type of fuel. Specific extrass of basic contaminants in 2-3 times more than at the time of incineration of oil or fuel oil. In addition during work of TES on a coal there is contamination of environment due to extrass from the systems of warehousing of fuel, at transporting of coal and his growing shallow [2-5]. At the same time these types of fuel can be used for creation of high concentrated suspensions, which show itself the mixture of dispersible coal water and chemical additions and can be used as fuel. Operating TES, as a rule have the area of growing shallow of hard fuel, on which a coal is ground down to the sizes 0 – 100 mkm The process of growing shallow is accompanied by destruction of aggregates, that provides rational, from the point of view creation of high concentrated water-coiled suspensions, particle-size of coal [4].

The use in quality the fuel of the high concentrated water-coiled suspensions has the row of advantages:

Ecological:

- HCWCS ecologically safe at all stages of production, transporting and use;

- the use of HCWCS allows in 1,5 – 3.5 times to reduce extrass in the atmosphere of dust, oxides of nitrogen, dioxide of sulphur.

Technological:

transforming generators aggregates on HCWCS does not need substantial changes of their construction;

- is allowed easily to mechanize and automatize the processes of reception, serve and incineration of fuel;
- is developed new technology of vortical incineration at a temperature 950-1050 Ñ allows to attain efficiency of the use of fuel higher 97% (at stratified burned coal the indicated size does not exceed 60 %);

Economic:

- on 15-30 % operating costs go down at the maintainance. transporting and burned;
- provides the decline in 3 times of capital costs at the transforming of TES and HES on incineration of natural gas and fuel oil on a water-coiled fuel:

the facilities spent on transforming of generators aggregates on HCWCS for 1-2.5 years are covered a cost.

At the time of analysis of physical and chemical properties of coal as object for creation of high concentrated suspensions, it is needed to take into account that they substantially change in the process of micro-nizing. The last is accompanied by not only lowering of molecular connections but also destruction of macro-moles with the origin of free radicals and oxygen-containing functional groups. In the conditions of crushing complexes TES the indicated phenomenon increases due to activation of the oxidizing processes related to the increase of temperature during the lead through of dry-milling.

At the receipt of HCWCS directly in a mill by the wet growing shallow water, which moistens hard particles, interferes with formation of the densely pressed aggregates, improves the degree of interfusion of particles during growing shallow and, getting in the microscopic pores of hard material at the blow of balls and bars at material. can correct splitter action, the same promoting speed of growing shallow [2,3].

The wet grade of coal is not only less power-hungry but also more simple, allows to conduct a process with greater specific productivity, less wears down bodies, facilitates introduction of chemical additions which getting to the cracks of solids, can be instrumental in additional growing shallow of material, intensifies the process of receipt of water-coiled

suspensions. At the wet growing shallow an environment is far less contaminated, the danger of spontaneous combustion goes down.

However at the wet grade as heavy as lead to attain optimum character of division of particles of hard phase on sizes. A question is far complicated at the use of low-ash and being fitting out coal, for which to attain an optimum particle-size it 's practically impossible after the one-staged chart of grade. That is why the wide use was got by a two-staged grade. He foresees preparation on the first stages of water-coiled suspensions of low concentration (to 40 %) in a cored or bullet mill, and on the second is receipt of HCWCS necessary concentration. Without regard to additional power expenses and bulkyness, a two-staged grade has the row of advantages, as it enables by introduct n of components of chemical additions on different stages to promote efficienc of action of reagents on the water-coiled systems, providing the same the receipt of suspensions with the preset parameters. In addition, as was indicated higher, the two-staged chart of grade allows to get the HCWCS desired particle-size in the case of the use of low-ash and being fitting out coal and also coal breed with an un clay mineral constituent.

At preparation of water-coiled fuel coal mass is added to micro-nizing. This feature is one of important descriptions of fuel. Water in this mixture loses the ordinary internals. Superficial pull of aquatic drops at nebulized in-bulk coal ground up shows up so strongly, that in the got dispersible-colloid mixture, dividing hard particles and waters elements is impossible. At nebulized the result of water-coiled suspensions we get large drops sufficiently (near 500 microns). That drops show itself a homogeneous structure. When such drop gets in a high temperature environment, superficial evaporation of water begins, more precisely, conditional water, accompanying by the increase of volume of these drops.

Practically after evaporation of superficial layer of particle are burning. At nebulized of fuel by the sprayer of his burning begins straight on the cut of sprayer, in that time as a traditional fuel (petrol, kerosene and other) must at first pass the phase of evaporation and already then at co-operation with oxygen to light up, but this evaporation passes very quickly. In this fuel coal particles are activated aquatic strim. As a result of this activating the temperature of spunking of fuel falls in two times. Activating of surface of drops results in the decline of temperature of spunking of water-coiled suspensions comparatively with spunking of braize: for fuels from an anthracite in 2 times, from the coal of brands of G and D in 1,5-1,8 times, and for fuels from a brown coal she a to 300-325 C. Process of burning of

HCWCS goes down is characterized by high plenitude of combustion of fuel (98-99,7 %). Because of the features of process burning which flow at relatively high concentrations of aquatic pair, a fuel burns without the extrass of carbonate mono-oxide and other compounds . Education and troop landing of hard parts of micro factions (to 80-95 %) sulphur oxides (to 40 %) and nitrogen of oxides grows short sharply (to 50 %). Substantial decline of extrass of nitrogen of oxides at incineration of HCWCS conditioned by a lower temperature in the area of burning, that does not exceed 1000-1250°C. The use of water-coiled fuel allows with greater efficiency to catch sulphur oxides due to the receipt of ashes particles with developed and active sulfase.

At incineration of water-coiled fuel takes place complete, very rapid and compact his combustion. It is predefined to those, that when the drop of fuel gets in a high temperature environment and is heated a point with the lowest power potential is in the center of drop, and the first blister there appears pair, and further this bubble grows and pushes away the hard particles of drop to periphery. And when all burns down, appears pour an agglomerate inwardly. Sintered ashes particles large enough – 100-200 microns, they there are no less than 30 microns. They can be withdrawn by ordinary separators [6-9].

Such incineration predetermines the receipt of ashes particles with developed and chemically by an active surface that is able to co-operate chemically and to adsorb of SO_2, NO_x and other gases.

Results and Discussions

Work is devoted to the search of terms of receipt of water-coiled fuel on the basis of wastes of enriching of coal and research of their operating descriptions. As research object we used the offcuts of enriching of coal of brand of "G". Black powder, by an ash-content 42,5 %, by humidity 1,65 %. The sizes of particles are 0,1-5 mm. As plasticizer applied of sodium lignosulfonate (LST).

Grades were conducted after one-staged and two-staged charts. A one-staged chart foresees the simultaneous load to to the mill of wastes, plasticizers, water and lead through of grade during the set time. After a two-staged chart load part of dispersible phase in the initia moment of time, part after the time set to the segment, with the purpose of achievement of greater difference in the sizes of particles.

For determination of optimum concentration of addition conducted the series of experiments on influence of maintenance of addition on

properties of suspensions. There were the chosen suspensions with concentration of dispersible phase 61, 63 and 65 % (the masses). It was set that during concentration of addition to 1,0-1,1 % from mass of hard phase there is the proof decline of viscidity of the dispersible systems. The systems with less concentration of addition are characterized by enhanceable viscidity at the increase of external action. The subsequent increase of concentration of LST does not give perceptible positive results.

On the first stage one-staged grades were conducted. There were the got systems with different concentration of dispersible phase. It was set that the increase of concentration of dispersible phase results in the increase of viscidity of the dispersible systems. Critical concentration of hard phase of suspensions at which begins sharply to grow its viscidity is 65-66 %. sedimentations firmness of the dispersible systems, determined as time, that passes to its stratification, grows at the increase of concentration of dispersible phase, probably due to achievement of more dense packing of particles in the system.

At the same time, as rotined the conducted researches, viscidity of the dispersible systems grows not only due to growth of by volume particle of hard in her but also due to the change of its particle-size.

The changes of terms of grade due to the increase of concentration of dispersible phase result in the increase of particle of small particles in the system. Thus the division of particles on sizes approaches mono-modal. Increase of concentration of dispersible phase more than 65 % during the lead through of grade results in intensive growing shallow of hard phase. Probably, at more dense packing, growing shallow of wastes takes place not only under action of bodies which are milled but also at the contact between itself. If to take into account that wastes was already added to the intensive growing shallow during the lead through of enriching mechanical durability of particles of wastes is insignificant. In addition high maintenance of mineral constituent (in this case clay) also results in the decline of mechanical firmness of particles of wastes. At lower concentrations in the initial moment of grade of particle of wastes does not influence on each other directly. The increase of concentration results in the origin of direct contact between the particles of hard phase that multiplies intensity of growing shallow. For the maintainance of optimum particle-size it was expedient to shorten time of grade, but then in the system there can be particles by sizes 200-400 mkm. The presence of particles of such size is unacceptable, coming operating descriptions of suspensions from.

The got results allowed to recommend at the receipt of suspensions on a one-staged chart concentration of dispersible phase 64-65 % (the masses).

With the purpose of achievement of optimum particle-size explored two-staged charts of grade to acceptability. The row of grades was conducted and got the row of the systems with different concentration of dispersible phase.

It was set that descriptions of the systems, got at a two-staged grade some worse, than the similar systems got one-staged grade. Probably, it is related to the particle-size of dispersible phase. The got systems are characterized by considerable maintenance of small particles. In addition, the value of electro-kinetic potential of particles, that is negatively reflected firmness of the got systems, goes down considerably. The lead through of two-staged grade is more power-hungry at the same time, and more difficult from point of apparatus registration. From foregoing it is possible to re-done a conclusion about pointlessness of application of two-staged grade at the receipt of high concentrated suspensions on the basis of wastes.

At the receipt of high concentrated water-coiled and suspensions for direct incineration it is necessary to take into account in heating of aggregates that temperature of suspensions in a pipe, that tricks into, as far as its approaching to heating will grow. That is why it was necessary to set character of influencing of temperature on viscidity of these systems. Conducted researches of viscidity of suspensions with concentration of dispersible phase 63, 64 and 65 % in a temperature range 25-70 °C it was rotined that at the increase of temperature there is the decline of viscidity for all explored systems. Taking to account that in a pipe pressure will be multiplied due to the increase of temperature, authenticity of corking of pipe is taken to the minimum.

There was the conducted analysis of gases extras which appear at incineration of wastes in a hard kind, as a water-coiled suspensions and at addition to the suspensions of marble dust. Incinerations conducted in the barn located in a muffle stove at a temperature by a 850 C. mass of ashes remain determined the degree of burning down of fuel constituent in the conditions of lead through of experiment.

As rotined our researches (tables.), at incineration of suspensions with maintenance of dispersible phase 62 % (the masses) (60 % it is coal; 1 % it is matter-plasticizer; 1 % it is marble dust), the extrass of gases grow short comparatively with incineration as a dust on the average on 45-50 %, comparatively with incineration as a water-coiled suspensions without

addition of marble dust on 20-25 %. Addition of marble dust does not result in growth of viscidity of the dispersible systems, place does not take diminishing of degree of combustion of fuel constituent. Mass of ashes remain grows at the same time, probably, due to salifying calcium.

Determination of amount of ashes anhydride and oxide of nitrogen, that appears at incineration highly ashes coal as a dust and as HCWCS rotined that reduction of extrass of gases took place both due to fastening of SO_2 and diminishing of amount of oxides of nitrogen. Knowing, that at incineration of coal and coal wastes as suspensions the amount of the got warmth does not diminish actually, is comparative with their incineration in a hard kind, probably due to more complete burning down of fuel constituent, creation of water-coiled suspensions and their use both fuels expediently as from economic and ecological points of view.

Table 1: Amount of acid gases which appear at incineration of unit of fuel

Type of fuel	Degree of burning down of fuel constituent	Mass of sour gases (on burned out a 1 ò fuel)
Hard wastes	82.3	34.2
HCWCS, C=60%	99.5	25,2
HCWCS. C-60% + 1% marble	98,4	16,1

Conclusions

The conducted researches allowed to re-done a conclusion, that water-coile .uel already today competition both in relation to the applied coal and in relation to an and gaseous oil .:. Cost of HCWCS, ready for the direct use, in a calculation on tone .. conditional fuel, below costs of fuel oil in 2-4 times and does not exceed _0 % costs of initial coal in place of his getting.

Thus, HCWCS is ready for the use in caldrons and stoves by a fuel and does not need the special preparation before his incineration. It provides work of caldrons in the calculations modes even at the change of internals of initial coal. Technology of production, storage, transporting and use of HCWCS relatively simple and can be fully automated. In addition, they fully zero-emission and environmentally cleaning, allow to organize their placing on dear territory of country. In opinion of analysts, at burned the obtained coal in the ground power plants, their potential energy is used on 40-45 %,

and in general – on 12-25 %. Application of HCWCS allows to avoid parts of losses.

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