

# **COMBUSTION OF THE LOW-GRADE FUEL AND RECLAMATION OF THE COMBUSTABLE WASTE IN THE FLUIDIZED BED FURNACE**

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At present the problems of ecology and rational utilization of natural resources including secondary ones such as coal cleaning waste or metal working plants combustible flows come up to the first place under the analysis of expediency of every reclamation methods. The main ecological safety aspects of different waste using are its reclamation with possible lower harmful substances effluents and possibility of waste-free technologies implementation. Low-temperature fluidized bed application allows to solve these problems by the most efficient way.

Fluidized bed combustion features are decrease of nitrogen and sulphur oxides atmosphere effluents and utilization of boundary ashed and hydrated combustible products, which earlier were related to the non-utilized waste category, for example coal cleaning waste, received in the process of its preparation for consumers or to the cake fabrication on the byproduct coke plants. The coal washing application is resulted in formation of the new class of fuel with high moisture content, non-combustible impurities and finely dispersed composition. This slurry, that almost is not used now, is accumulated in dumps and pollutes environment. At the same time all kinds of such waste are containing only 15-30% of combustible components and can be used as a fuel for fluidized bed boilers. Dozens of millions of tons of such waste are thrown out to the dumps annually in Russia.

Traditional torch burning of the water content fuels in the chamber furnace in the form of coal-water slurry (CWS) is connected with the serious difficulties (prolongation of the ignition and combustion processes, degradation of the boiler operating conditions and etc). More effective method of coal washing wastes utilization is burning in the boilers with low- temperature fluidized bed. This allows not only to utilize the pulp, but to reduce harmful substance effluent with the products of combustion. Technology of fluidized bed combustion of coal cleaning waste allows to realize waste-free technology because ash contains not more then 1% of combustible components and can be used in building material industry.

Laboratory investigation of the kezelovsky coal ( $A^r=49,7\%$ ,  $W^r=1,3\%$ ) showed that under the temperature from 720 up to 950°C  $q_3$  and  $q_4$  in total didn't exceed 4,2-5,5%. The temperature regime with low sulphur oxides concentration level were obtained. Sulphur oxides bonding was about 65-70% ( $Ca/S=1,8$ ,  $t_{fb}=720-950^\circ C$ ). The burning coal-water slurry with moisture about 36-50% showed that nitrogen oxides concentration didn't exceed 100 mg/m<sup>3</sup>

Subject characteristic property testing of the CWS burning processes in the fluidized bed overhaul of the boiler ДКБП-4-13 furnace with rough atomization nozzle installation in the capacity of the fuel supply equipment was made. For stable burning it was enough the only rough atomization nozzle for furnace area about 2,7 m<sup>2</sup>. During the test the boiler carried full load. Trial operation of the boiler verified increase of ecological safety.

Waste petroleum products formed in production process at metal-working plants are partially used at the same plants or at the oil regeneration factories for further utilization. However nowadays requirements for the waste petroleum products, which are subject to regeneration and further utilization, are sufficiently stringent. Only waste motor and industrial oils collected in plants directly from the machines cases satisfy these requirements. The main mass of oil waste, consisted of fuel oil, oil and emulsions mixture with mechanical impurities, is concentrated in plant oil traps of process water reverse system and is subject to destruction or burial. The most of plants solve the waste processing problem traditionally: the plants remove oil waste into the dumps, organize storage ponds, burn it in the hot flame. Each of these methods has its own disadvantages and doesn't give the complete solution of problem.

The possibility of efficient oil waste burning in the low-temperature fluidized bed is proved by carried out investigations. This technology allows to ensure low combustion temperatures (750-950°C) in order to reduce level of the toxicity nitrogen oxides effluents. During the test burning layer temperature didn't exceed 950°C. Operations were optimized in order to reduce nitrogen oxides concentration up to 75 mg/m<sup>3</sup>. Burning of oil waste with water content about 50% without additional fuel mixture preparation was carried out. Possibility of deep sulphur oxides bonding with small quantity of absorption dopants (dolomite, limestone) is shown. In these cases high-grade fuel can be replaced by concentrated waste. Based on laboratory and industrial tests results contractor design of

reclamation unit with output about 50 kg/h is completed. This reclamation unit can be designed with taking into consideration the concrete plant conditions.

Positive results of experimental investigations and test industrial combustion of high-ashed and high-moisture coal cleaning waste and water-bear oil slimes from oil refineries in redesigned boiler ДКБП-4-13 with fluidized bed furnace were obtained that allows to start industrial application of such technology.