

IMPORTANCE OF COMBUSTION EQUIPMENT FOR MODERN SOCIETY

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Combustion equipment is an indispensable part of modern society devices. At present the society seeks for comfort and conveniences more and more. Heat and electricity are essential for people now, and furnaces provide these essential devices, facilitating people's lives and making it easier and more comfortable. Nevertheless, reliability is one of the main requirements for combustion equipment.

Basic combustion methods, advantages and disadvantages of combustion equipment and its impact on the environment are presented in the paper.

A fire box is the basis of traditional boilers; it is the fire box where the conversion of chemical energy of fuel into sensible heat of the combustion products takes place. After that the subsequent transfer of the heat to the heated substance occurs through the heated surface.

A furnace is a device for the combustion of fossil fuels in order to obtain highly heated flue gases. The resulting thermal energy is usually converted into electrical energy or mechanical one or it is used for technological purposes.

Any furnace has to meet the following requirements:

- reliability;
- simplicity of design;
- minimal chemical and mechanical incomplete combustion;
- ability to operate using reserve fuel;
- ability to work with a wide range of regulation of the heat load.

The article describes the four basic ways of fuel combustion: layered; flaring; vortex and fluidized-bed reactor.

Grate furnaces.

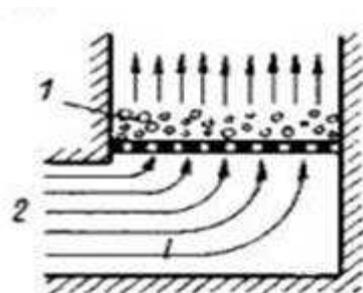


Figure 1 shows a combustor where a fuel dense layer (1) is burned in a layer which lies on a grate and the air is blown (2) upwards. This method is used in boiler units with the capacity up to 40 t/h of steam. Lignite, black coal, semi-anthracite, sod peat, oil shale and wood waste are burned in this way.

Chamber (flaring) furnaces.

A chamber furnace is usually performed as a rectangular prismatic camera. It consists of vertical walls, the ceiling and the sloping bottom or hearth made of refractory materials. Fuel screens are usually placed on the inner surfaces of the chamber furnace; the screens are made of 32-76 mm diameter pipes, where boiling water circulates. The ceiling or the wall radiant superheater (in steam boilers) is located also on the inner surfaces of the chamber furnace. Fuel is injected into the furnace chamber through the burners: with the air necessary for combustion. These devices are placed on the walls of the furnace, as well as its corners. Fuel is combusted in the air stream.

The pulverized solid fuel is burned in such furnaces, as well as gaseous and liquid fuels.

Vortex (cyclone) furnace.

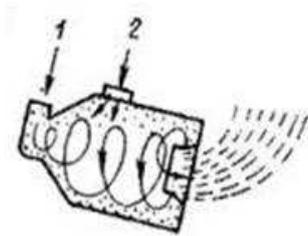


Fig.2 Vortex Furnace.

In the cyclone furnace the spiral movement of gas-air flow (2) is performed. The gas-air flow carries the particles of fuel (1) and slag. Vortex combustors are used as furnace extensions of chamber furnaces for thermal power plants as well as process furnaces, for example for roasting copper ores.

Fluidized bed combustion.

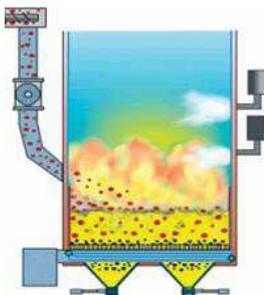


Figure 3. Scheme of fluidized bed combustion.

When the speed of the air, which is blown through the bed, increases, the aerodynamic force, which affects every particle of the fuel, overcomes the forces of mutual friction of the particles. The further increase of the air flow combustion leads to the seeming effect of boiling ("fluidized bed" comes from it), its height and the porosity increases.

Power engineering plants are the main air pollutants. The reason is that most of the power plants are located in cities. At present human civilization has faced a number of global environmental problems that threaten the civilization's very existence. One of the major challenges, which are facing scientists and specialists, is to solve the problem of pollution of cities where the majority of population lives. A lot of harmful ingredients come into the atmosphere of cities because of combustion of fossil fuels in power plants, industrial and utility boilers.

According to preliminary estimates of experts, the total quantity of solid fuels in Russia should be sufficient for about 500 years; this calculation determines long-term prospects for their use in domestic power engineering. Taking into consideration the trend of increasing power exports (gas, oil, electricity), we should expect a growth of power plants and boilers, which can burn solid fuel. So, the increase of energetic and economic indicators for solid fuel boiler is an important and urgent task for the near future.