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Д. Л ИБОЯН, студент гр. ЭТ–192 (БГТУ)
И. И. Беловодская, ст. препод. (БГТУ)
г. Белгород

ECONOMIC EFFICIENCY OF THE BOILER ROOM'S TRANSFER OPERATION WITH SOLID FUEL TO GAS

The theme of my article refers to the thermal power industry. Thermal power industry is a thermal engineering sector, which is engaged in the transformation of heat into mechanical and electrical energies. Heat-sets are used for generating mechanical energy by heat. This mechanical energy is used for driving the working machines or electro-mechanical generators by means of which electricity is produced. Conversion of heat into mechanical energy in thermal power devices is based on the ability of gas or vapor of the body to perform mechanical work with volume change. At the same time the working fluid (gas or steam) must make closed sequence of thermodynamic processes (cycle). As a result of such a cycle of one or more heat sources is taken a certain amount of heat Q_1; and one or more sources of heat given to the amount of heat Q_2, less than Q_1; while the difference $Q_1 - Q_2$ converted into mechanical work A. The ratio of the resulting heat is called expended thermal efficiency of the cycle [1].

$$\eta_t = \frac{A_{\text{теор}}}{Q_1} = \frac{Q_1 - Q_2}{Q_1} = 1 - \frac{Q_2}{Q_1}$$

The processes, occurring in the real facilities that convert heat into other forms of energy, accompanied by a variety of losses, which results in a valid work, which is less than the theoretically possible work. The ratio of these works is called the relative effective degree of efficiency η_{oe},

$$\eta_{oe} = \frac{A_{\text{действ}}}{A_{\text{теор}}}$$

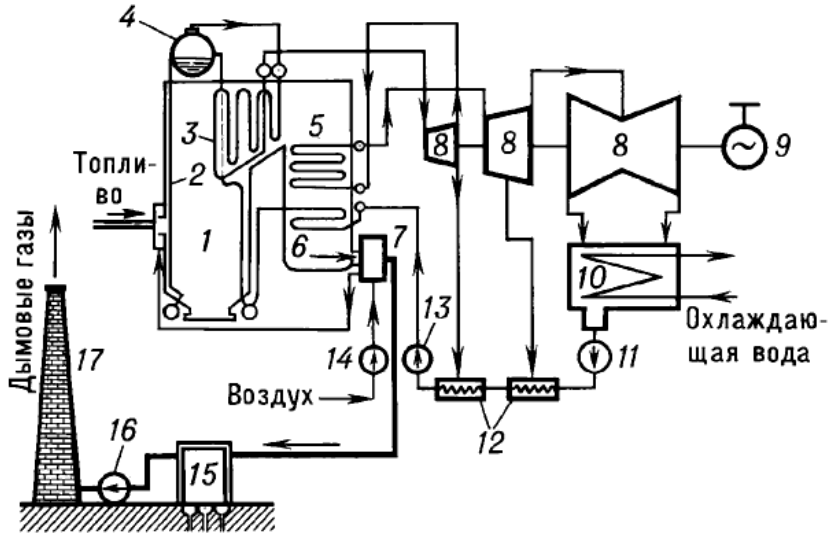
From (1) and (2) we get A = Q_1* η_t* η_{oe} = $Q_1\eta_e$, whereη_e = η_e* η_{oe}– effective degree of efficiency. If all other conditions are equal, the efficiency of conversion of heat into work depends on the temperature at which this heat is transferred to the working fluid. The maximum work is called operability or exergy of the heat.

$$l_a = Q \cdot \eta_k = Q\frac{T_1 - T_0}{T_1}$$

From (3) we see that when Tl = TO, exergy of heat is equal to zero. By way of transferring heat to the working fluid external supply installation (heal to the working fluid is supplied from an external source to the heat exchanger) and internal supply installations (working fluid - combustion products) are distinguished [1, p.231]

The comparative analysis of boiler plants

1. Boiler unit



In this Figure we can see the work of the condensing steam turbine power plant. First of all, the boiler elements are numerated 1-7, 13-17.

1 - Firebox of a boiler - a device designed to burn pulverized fuel consisting of two series posted chambers separated tube bundle.

2 - Radiant section tubes - pipe located in the zone of the highest temperatures, mainly perceive heat by radiation

3- Superheater is a device for superheating steam, i. e. to increase its temperature above the saturation point. The use of superheated steam can significantly raise the efficiency of the steam plant.

4 - Drum boiler unit is element, which is filled with a certain amount of working fluid level and space level.

5 - Super heater for reheating is element of a boiler for steam superheating. It consists of parallel steel tubes reinforced with an internal diameter of 20-60 mm, attached directly to the drum of the boiler or to the input, output, and sometimes to an intermediate collector (camera).

6 - Economizer is element of the boiler unit, the heat exchanger, wherein the feed water is fed to the boiler is heated outgoing gases from the boiler.

7 - Air Heater is device for heating the air before feeding it into the blast furnace. The introduction of the stoves was the most effective way to save fuel

(coke) in the history of blast furnace production. Current heaters are allowed to feed into the blast furnace, heated to 1300 ° C.

8 - Feeding pump feed pump is designed to supply water at up to 165 stationary steam boilers of thermal power plants using fossil fuels

9 - Blow fan is rotor, which in a certain way fixed blades that when the rotor, facing the air, it is discarded. From the position and shape of the blades depends on the direction in which the air is discarded.

10 - Ash collector is device for cleaning flue gases from fly ash

11 - ID fan (induced-draft fan) is designed for flue gases in stationary steam and hot water boilers.

12 - Smokestack. The main purpose smokestacks are removal of gases and other products of combustion. With the gases through the flue pipe boilers are removed soot, smoke, soot and ash. Another function of chimneys is software normal traction; it must be in direct proportion to the height and thickness flue channel [2, p.45-56].

2. The work of coal boilers.

Coal-fired boiler plant is a convenient and economical way for effective solution problems of heating and hot water supply facilities for any purpose. Efficiency of coal-fired boiler is quite high - 84%. It allows ensuring the effective work in a full volume. For mechanization of fuel feeding and disposal remains of fuel burnt a sufficiently large thermal capacity of the boiler room (single power supply must not be less than 1 MW) is required. On coal-fired boilers low power fueling and servicing of boilers are made by hand. Management of electrical boiler unit and boiler room is made from a special control cabinet.

Advantages

A key advantage of the coal boilers is the availability of fuel. For their operations are not necessary any liquid fuel or gas, while the cost of construction of such assemblies is relatively small.

Modern block-modular coal boilers have the following advantages:

1. Simplicity of execution.
2. Modern technology,
3. The high reliability of the equipment.
4. Long term boiler service life and equipment.
5. Simplicity and the convenient operation.

In addition, the operation of coal-fired boiler does not require a large number of serving employees [2].

Disadvantages

Coal-fired modular boilers have certain disadvantages:

1. The need for a continuous monitoring of the combustion process.
2. Lack of opportunity of a full automation of the boiler room.
3. Necessity in daily cleaning of the furnace.

4. The need to have quite a bulk storage area for coal.

5. Ensuring immediate delivery and loading of fuel.

All this, of course, requires a lot of time and cost involved, respectively, increases the overall cost of heat.

3. The work of oil-fired boiler plants Oil-fired boiler plants are enough popular and common type of boiler plants. The reason is the relatively low cost oil. Oil-fired boiler plants are more profitable to operate than boilers for solid fuels.

Certainly, the use of natural gas is the ability to minimize the cost of production of thermal energy, but access to the low-cost fuel for this is not universally available. Oil-fired boiler plants will qualitatively function everywhere and the application of modern technologies can provide efficiency of their operation [3].

4. Operation of gas boilers

Gas boiler installations today are the most popular and popular source of heat. This equipment is widely used in various fields and used to provide with heating and hot water to a variety of objects. Besides, gas boilers are used in heating agricultural facilities.

Modern gas-fired boilers have the following advantages:

1. Efficiency and convenience. Boiler rooms are not linked to outdated communications and provide the right amount of low-cost production of thermal energy.

2. High efficiency. The indicator of efficiency of modern gas boiler is currently considered to be the best. This figure rises to 95 percent. Furthermore, they are of the best quality and supply of heat.

3. Environmental friendliness. Operation of manual of modular gas boiler installation involves the use of natural gas. This is not only environmentally friendly and safe, but also the most affordable cost fuel. When using gas boiler installations at oil facilities associated gas can be used in the form of fuel.

Modular gas boilers in comparison to other types of boilers have a sufficiently small size.

4. Mobility. Plants are free to move to any area of operation [3, p. 392-393].

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Информация об авторах:

Ибоян Давид Лаертович, студент гр. ЭТ–192, БГТУ, 308012, г. Белгород, ул. Костюкова, д. 46, davaibo18@gmail.com

Беловодская Ирина Ивановна, ст.препод., БГТУ, 308012, г. Белгород, ул. Костюкова, д.46, **irinabelovod@mail.ru**