

PROVIDING ELECTRIC ENERGY IN AGRICULTURAL MELIORATION SYSTEMS

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Abstract: This article describes the use of gas piston power plants, which is relevant for the remote location of a reclamation system. It is also indicated by its further expansion and great distance from electrical networks, allowing work to be carried out regardless of external energy sources with minimal costs, since the use of a gas piston installation as the main source of energy is an economically advantageous solution.

Key words: electrification, gas piston power plants, energy, land reclamation, hydrological conditions, soil conditions, agroclimatic conditions. Possible methods of using block gas piston power plants in land reclamation systems to reduce cash costs are presented.

Agriculture has been helping humanity to survive for a huge period of time, providing food, raw materials for making clothes, etc. But huge harvests gradually deteriorate the quality of the soil; many means are used to combat this, including fertilization, harrowing and others. One of the methods of preserving soil quality and productivity is reclamation. Melioration is a set of organizational, economic and technical measures to improve hydrological, soil and agroclimatic conditions in order to increase the efficiency of use of land and water resources to obtain high and sustainable crop yields. Reclamation differs from conventional agricultural practices in its long-term and more intense impact on land reclamation objects. Reclamation is work aimed at improving the properties of lands and increasing their productivity.

The most large-scale types of land reclamation are irrigation and land drainage. Irrigation is used for areas with insufficient moisture in the soil and for crops with an increased need for water. And drainage in particular for wetlands, often it is impossible or unprofitable to supply a permanent electrical network to such places; gas piston power plants are excellent for such areas because they can be easily placed in a container that is easy to transport, while it is protected from external weather conditions, is compact and is installed into operation as soon as possible. The possibility of obtaining thermal energy for domestic needs and heating through a heat exchanger is a plus for cheap electricity. Gas piston power plants are an excellent solution for both temporary work camps and permanent buildings and businesses such as pumping stations. The use of gas piston power plants is relevant when the reclamation system is located remotely with its further expansion and at a great distance from electrical networks, allowing work to be carried out regardless of external energy sources with minimal costs since the use of a gas piston unit as the main source of energy is an economically advantageous solution. Inexpensive gas and high efficiency reduce the cost of energy for the enterprise.

With a power plant load factor of 70% and a gas cost of 6,800 rubles/1,000 m³, the average cost of energy generated by the GPU will be 2.7 rubles/kWh. Which is more economical than the standard one-rate electricity tariff of 4.32 rubles. for 1 kWh.

Advantages of gas piston units:

- 1) Gas piston power plants have a higher efficiency compared to gas turbine ones.
- 2) A slight decrease in the efficiency of gas piston Mini-CHPs with a decrease in the electrical load in the regulation range. At 50% load, the efficiency of a gas turbine decreases by 1.5 times from the efficiency at rated load, while the efficiency of a gas piston generator under the same conditions decreases only by 2.5-3%, which can only be partially useful when operating an enterprise, with

reduced power in case of an emergency or planned shutdown of individual parts (shutdown of one unit of a livestock farm, etc.).

3) Stability of the efficiency of a gas piston installation when environmental parameters change. It is known that the efficiency of a gas turbine engine largely depends on the air temperature at the compressor suction. If the ambient temperature increases, the electrical efficiency of the gas turbine generator drops significantly. For gas piston installations this dependence is less critical, which will help the development of agricultural enterprises in harsh climatic conditions

4) Less (compared to gas turbine units) sensitivity of gas piston Mini-CHPs to frequent starts and stops.

5) Ease of maintenance of gas piston mini-CHPs. It should be noted that maintenance and repair of gas piston generators is carried out at the installation site, while repairs of gas turbines are carried out, as a rule, at the manufacturer.

Most brands of gas piston stations (installations) can operate in cogeneration mode, that is, as thermal power plants. The temperature of the exhaust gases at the exit from the engine of a gas piston installation is approximately $390 \pm 30^{\circ}\text{C}$. This temperature at the station outlet allows for the delivery of sufficiently high volumes of free thermal energy.

Gas engines can use different types of gas: natural, gases with low calorific value, low methane content and low degree of detonation, or gases with high calorific value - flare, propane, butane, and they are also adapted to be converted to work from one type of gas to another. In addition, it is possible to use two fuel engines operating simultaneously on liquid and gaseous types, which leads us to a large selection of fuels:

- propane-butane mixtures;
- natural gas (liquefied, compressed, mainline);
- associated petroleum gas and vapor from large reservoirs;
- industrial gas (pyrolysis, coke oven, mine, waste water gas, etc.);
- biogas obtained by processing waste.

The advantage of such power plants is their short payback period, amounting to only 2-3 years. Mini-CHP allows you to save more than 40% of gaseous fuel energy compared to the separate production of electrical and thermal energy. What will have a positive impact on the profits of enterprises is that the lower the costs, the greater the profit. Electrical and thermal energy generated at a mini-CHP can be consumed locally, as well as sold to neighboring consumers or to the network, which will help recoup some of the fuel costs. At the same time, the efficiency mini-CHP accounts for about 90%, and since energy consumers are located next to it, energy losses during distribution are less than those of centralized electricity and heating networks. This also reduces the cost of the energy produced.

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