INCREASING THE AMOUNT OF THERMAL ENERGY PRODUCED IN A COGENERATION UNIT ON THE BASE OF INTERNAL COMBUSTION ENGINE

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In small-scale electrical power engineering, the approach of combined generation of electric and thermal energy has become widespread that presupposes burning of fuel in a reciprocating internal combustion engine connected to an electric generator, and utilization of the heat of the engine's exhaust gases in a recovery boiler. Such plants operate on both traditional and alternative fuels, including biogas, mine gas, landfill gas, etc nowadays. This leads to high prospects for their further development and use.

It is known that the ratio between the maximum values of thermal and electrical loads of typical small-scale electrical energy generation facilities is in the range from 1.4 to 5. Therefore, the common disadvantage of such installations is the insufficient amount of thermal energy in relation to the amount of electricity produced for these installations to satisfy consumers' thermal energy need by their own. One of the main ways to increase their efficiency is the use of heat from the systems of liquid cooling, lubrication, intercooling of boost air after superchargers. For stationary installations, following this way is now becoming mandatory that allows utilizing more than 80-85% of the heat supplied with the fuel.

Another approach that is developing is the mixing of exhaust gases with additional air, which is injected into the external combustion chamber, where additional portions of fuel are burned to increase thermal productivity. After that the exhaust gases are treated in a recovery boiler the usual way. The disadvantage of such schemes is that the additional part of the air reduces the temperature of the combustion products during mixing.

In order to reduce the effect of this shortcoming authors propose and consider a scheme of installation that provides for the use of a reconditioned two-stroke piston engine. Additional air is supplied to the external combustion chamber through the intake system and the engine cylinder by means of the engine own supercharger. The amount of purge air is coordinated with the supply of additional fuel in the external combustion chamber required to fully meet the user's need for thermal energy. With this installation scheme, the efficiency of the engine operation and electricity generation is reduced, but in the same time the additional air is heated from the surfaces of the combustion chamber of the engine, which increases the overall efficiency of the installation and reduces the thermal stress of the main elements of the engine.

A patent certificate has been obtained for the proposed method of combined generation of electric and heat energy.