

Igor Lysenko

A.Yu. Usenko, research supervisor

I.P. Nikitina, language adviser

National metallurgical academy of Ukraine, Dnipro

Analytical Study of Efficiency of Solar System and Heat Pump Equipment Joint Work

One of the most effective energy saving methods that enables to save fossil fuels, reduce pollution, meet the needs of consumers in process heat is united usage of a solar system and heat pump equipment for residential and industrial needs.

This equipment, solar collector and heat pump, was taken with the aim of improving the efficiency of the heating system. This system ensures the consumer thermal energy for heating, hot water and ventilation.

The paper examines the peculiarities of solar collector operation. It was concluded that its individual work doesn't allow ensuring consumers of heat energy adequately and fully, but can compensate only part of the needs. Solar collector can be used as a source of low potential heat which is used for the heat pump.

The question of consumption of traditional fuels increasing associated with permanent development of countries and their industrial sector was considered. The dependence between GDP growth and fuel consumption, which also leads to increased greenhouse gas emissions, has been installed.

International events for emissions reducing including greenhouse gases were considered. European experience in using alternative energy sources and their competitiveness compared with traditional fuel has been specified.

The features of solar system and heat pump work depending on the method and place of use were presented. Advisability of joint use of various alternative sources of energy in order to improve efficiency and achieve autonomy in their work was justified. Two options for using a system consisting of solar system and heat pump was proposed and discussed. The first option is increasing the efficiency of the heat pump by preheating a low potential heat source with solar system. The second option is a joint operation of solar heating systems and heat pumps that will allow operating at lower ambient temperatures will result in reducing heating surface solar collectors and increasing efficiency.

As a result, the dependence between the heat pump productivity from the preheating of low-grade heat source when using solar installations was worked out. The joint work of the heat pump and solar collectors will lead to reducing the burden on the heat pump during periods of active operation that will save the energy consumed by the heat pump equipment.