

## **PROSPECTS OF DEVELOPMENT OF HEAT PUMP EQUIPMENT**

Barsukova H., Ph.D

*Sumy National Agrarian University, Sumy, Ukraine*

An important place in the fuel and energy balance of the country: cities and other settlements, is occupied by low-temperature heat. It is mainly spent on the communal needs of industrial enterprises, the housing sector and the communal sphere. About 40 % of fuel is used for heating and hot water supply, and more than 50 % of heat consumption is covered by thermal power plants, large district and industrial boilers, the operation of which is associated with a significant negative impact on the environment. Under these conditions, as well as due to the rising cost of fuel and its deficit, it is becoming increasingly important to attract secondary energy resources to the fuel and energy balance. The industry has achieved some success in the utilization of high-temperature secondary energy sources - liquids with a temperature of more than 160 °C and gases with a temperature of more than 190 °C. Instead, the utilization of low-potential heat is practically not realized. At the same time, the total volume of low-temperature heat sources is about 60 %. Cooling water of turbine condensers, cooling media of generators, waste heat from enterprises, aeration stations, thermal waste from agro-industrial complexes, etc., containing thousands of MW of energy, are released into the environment, worsening the already unfavorable environmental and urban environment centers [1].

The main factor that hinders the utilization of waste heat is its relatively low temperature potential. For the same reason, do not use unlimited heat sources scattered in the ground, groundwater and water of natural reservoirs, in the air. In light of all the above, special attention is drawn to heat pumps - installations that, due to the consumption of a small amount of electricity, make it possible to increase the heat potential of these low-temperature sources to the required level. Today, heat pumps are the most promising thermal power plants that effectively use low-temperature heat [2].

Heat pumps are devices that perceive the heat of the environment for further transfer to its body with a higher temperature. Thus, with the help of a heat pump, heat is transferred from a colder body to a hotter one, using additional energy. The use of heat pumps seems to be one of the important ways to utilize the heat of secondary energy resources. It is known that the heat of low potential is a product of human technical activity, and the lower its temperature level, the more this heat is irretrievably lost, dissipating into the environment. Examples of carriers of such heat are heated air coming into the atmosphere from ventilation and air conditioning systems, or warm domestic and industrial wastewater with a temperature of approximately 45 °C. Quite often the only economically justified way to utilize the heat of such

secondary energy resources is the use of heat pumps, which can use both heat produced in various technical devices and heat from natural sources - air, water, natural reservoirs, soil [1].

The main area of application of heat pumps at this time - heating of the heat carrier for systems of heating, ventilation and hot water supply of buildings. However, they can also be used for technological purposes.

Heat pump systems are widely used in the United States, Japan, Canada, France, Sweden and other developed countries. They are used for heating, hot water supply, air conditioning, in the drying of wood, paper, grain, for heating greenhouses, food production, for desalination, water distillation and many other areas. Foreign heat pump installations are mainly aimed at heat supply and air conditioning of individual consumers. Thus, sales of heat pump air conditioners in the United States in recent years are maintained at about 0.8 million units annually. An active energy saving policy is being pursued in Japan, as a result of which sales of heat pump units have reached more than 1 million units. The total number of heat pumps in the world by 2001 exceeded 30 million. The total number of heat pumps installed in the United States is estimated at more than 8 million, which is about 10 % of the total number of heating systems. Europe also uses heat pumps in large quantities [3].

The ability to use environmental energy in heat pumps opens up new energy saving needs in the field of housing and civil engineering. At the same time, the conversion of low-potential environmental energy is associated with the cost of electricity and a high cost of equipment.

Meanwhile, in all CIS countries there is a serious lag in the practical implementation of advanced developments in the field of heat pump technology. The main reason is the unfavorable price ratio for electricity and fuel at the time for heat pump installations. The economic efficiency of heat pump systems that consume electricity and save fuel is higher the cheaper the electricity and the more expensive the fuel. If earlier in the USSR this ratio was significantly higher than in other industrialized countries, then after the formation of Ukraine as an independent state, it changed in the opposite direction, is the economic conditions for the development of heat pumps and heat pumps became more favorable.

### ***Bibliography***

1. Дикий Н. А. Комбинированное производство энергии для преодоления кризиса в энергетике. Экотехнологии и ресурсосбережение. 2000. № 1. С.13-172.

2. Промышленная теплоэнергетика и теплотехника: Справочник. М.: Энергоатомиздат, 1991. 586 с.

3. Оценка воздействия объектов энергетике на окружающую среду /Г. А. Белявский, Г. Б. Варламов, В. В. Гетьман и др. Х.: ХГАГХ, 2002. 369 с.