

INNOVATIVE HEAT TECHNOLOGY FOR THE PRODUCTION OF HEAT FROM RENEWABLE ENERGY SOURCES

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Purpose: creating innovative heat engineering for the production of heat from renewable energy sources.

Ukraine, like a significant number of European countries, imports more than 60% of energy. Fix this imbalance in energy consumption by possibly using renewable energy sources (RES). Ukraine has committed to produce 11% of energy from RES by 2020. In other European countries, this figure is much higher, from 13% of Belgium's commitment to 49% in Switzerland.

What technologies are used by RES in the world. There are a lot of them, I will dwell on those heat technologies that we are engaged in for the production of heat. To compare the efficiency of different technologies, use the fuel utilization factor (FUF). The calculations show that the largest FUF has heat pump technology. They have a FUF from 90% in compression heat pumps (HP) with an electric drive of up to 85% in HP using the drive from the internal combustion engine. Due to which HP have such a high FUF? Due to the use of low-potential energy sources (LPES). LPES can be different - it's geothermal energy, the heat of sewage, the warmth of open reservoirs, the warmth of air, and many others. In general, the potential of LPES exceeds the energy of the explored traditional energy resources by 80 times. In Ukraine, for example, the approximate potential of sewage with $T = 12-20\text{ }^{\circ}\text{C}$ in 180 cities, townships and villages is 5000 GJ. Economically feasible volumes of production of commodity heat energy with the use of thermal energy of sewage with the help of TN make 2138 thousand tons of conditional fuel per year. It is equal to 10% reduction of heat energy in heat supply systems and is equivalent to replacing 1,7 billion cubic meters of gas. Only Kyiv, with 2600 km of sewage networks, has a technically feasible sewage potential 4,7 million Gcal per year, equivalent to replacing 0,5 billion cubic meters of gas.

Results of work. We have developed and implemented a heat pump system of hot water supply with a capacity of 1,5 MW in the city of Kramatorsk. She uses LPES as untreated wastewater and saves 1,47 million m^3 of gas annually to the city.

The calculations show that the energy saving potential of heat supply and hot water supply systems in Ukraine is equal to 26,55 million tons of conventional fuel per year, which is equivalent to saving 20 billion cubic meters of gas.

One of the most effective RES in Ukraine is peat. Its reserves amount to about 2 billion tons. In 1928, the share of peat in the fuel balance of Ukraine was 35%, but with the exploration of large gas reserves, the share of peat in the energy balance fell significantly. Why is peat used as a fuel, despite the fact that

it is still a source of very effective organic humic fertilizers? Because the cost per unit of energy from peat is 3 times less than the cost per unit of energy from gas. And compared to coal, fuel from peat contains significantly less sulfur and ash. At burning this fuel almost does not emit toxic substances, and ash is used as fertilizer.

We have developed heat technology for the processing of peat and biomass into composite fuel from the extraction of humic substances as organic fertilizer, which is sold in Socialist Republic of Vietnam. As a result of such processing, we obtain composite peat briquettes with a moisture content of 10-15%, a filler content of up to 40% and a combustion heat of up to 18 MJ, and a solution of sodium humate with a dry matter content of up to 10%. Heat technology is protected by patents for the invention and the approved technical specifications.

Conclusion: according to our calculations, the technically feasible potential of using heat pump thermal technologies in heat supply and hot water supply systems, according to our calculations, is 62,6 billion kWh per year, which is equivalent to replacing 8,4 billion m³ of gas, and peat today is one of the most effective types of local fuel.