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CURRENT ISSUES OF ENERGY-SAVING TECHNOLOGIES

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ABSTRACT

The main issues of energy saving and design of energy-saving technologies are presented for discussion. The current state of the art in this area, as well as promising developments are shown. The possibilities of alternative technologies are presented. The possibilities of creating devices based on superionic materials with prospects for use in alternative energy are also proposed.

Keywords: energy, energy conservation, renewable sources, superionic materials, wind energy.

INTRODUCTION

Due to the fact that natural energy reserves such as gas, oil, coal are not infinite, humanity is globally facing the issue of alternative energy and energy conservation. Natural and urgent on a global scale are the issues of energy conservation, which are carried out in different ways: these are scientific methods, and economic measures, and legislation (V.Ya. Ushakov.). In addition, the result of using traditional forms of energy are emissions of harmful substances into the atmosphere. The use of energy sources such as gas, oil, coal is gradually receding into history. The end of the 18th and beginning of the 20th centuries was commonly referred to as the century of steam and steam and gas engines. The age of steam has gradually been replaced by the age of electricity, which is produced by various labor-intensive and resource-intensive methods (Renewable Energy). The most rational and environmentally friendly type of electricity is and remains electricity generated by hydroelectric power plants. There are many advantages of this method, but there are also some peculiarities, these are:

- The cost of electricity produced by hydroelectric power plants is much lower than the cost of electricity produced by other methods;
- Depending on the amount of energy required for consumption, hydroelectric generators can be switched on and off quite quickly: the moments of switching on and off are not so inert;
- Water used in hydroelectric power plants is not polluted or wasted, it is accumulated in reservoirs and is renewable;
- The impact on the environment is minimal.
- Beneficial effect on the climate in the surrounding region, the surplus accumulated water can be used for agricultural activities;
- The reservoir itself is suitable for use for fish farming development.

However:

- Requires large capital investment in construction and design;
- Due to the scale of the structures require remote location from consumers and large areas;
- However, reservoirs occupy large areas that could be used for agricultural purposes.
- Dams and dams, in order to secure flood threats, require constant costly overhaul.

The human brain is meticulous and tireless. In a fairly short period of time, an alternative to thermal power and hydropower has been developed. This is nuclear power. But it is not entirely acceptable or profitable. Let us recall the example of the Chernobyl nuclear power plant. Solar power, which has recently begun to develop, is also not very efficient. Other types of alternative energy are also labor-intensive and require construction of cumbersome facilities, such as wind turbines (E. Sazonova, A. Topalov.). To date, there are many projects (T.I. Andreenko, S.V. Kiselyova.) such as the use of current produced by plants as a result of photosynthesis. But so far the efficiency of this method is low and not suitable for industrial use. Therefore, in addition to the introduction of innovative technologies, the issue of energy saving is still acute. Mankind quickly gets used to the benefits of civilization does not always think about the fact that all available resources and subsoil have their limit, used without much economy (V. Sidorovich.). The purpose of the said reduces to an English proverb "A penny saved is a penny gained", i.e. a penny saved is equal to a penny earned. This article discusses energy conservation.

METHODS

In the main section we use calculations of energy savings based on the methods of thermodynamics and molecular physics. Here we will not give calculations and cumbersome formulas, just come to the obvious solution based on classical definitions and concepts.

So, the use of even electrical household appliances leads to the consumption of a huge amount of electricity. Until recently, we lit our homes, offices, schools, etc. with incandescent bulbs, which wound up a huge number of kWh of electricity on our meters. It is only in recent decades that low-energy diode lighting has become ubiquitous. Energy saving as a way to meet the growing need for energy and energy resources is 2-5 times more profitable than the construction of new facilities for the production of heat and electricity for the same purpose. This is especially felt in the winter season, and therefore we all well imagine and see, the problems that presents us the winter: lack of gas, electricity. And is there really less gas? Let's think about it. Every schoolboy knows from the course of not only physics, but also from the course of natural science, that as the temperature rises gases expand in volume, and with decreasing temperature the volume decreases significantly. Even a temperature drop of 10 degrees gives a significant decrease in the volume of gases. Reduction of volume and temperature, as we all know from thermodynamics course, leads to reduction of gas pressure (remember the basic equation of molecular kinetic theory of gases: pressure P is proportional to kT absolute temperature).

Our gas supply pipes, made of iron and conducted for safety purposes outside. The air temperature outside during the winter is minus. The gas pressure naturally drops catastrophically. There is not less gas. Its pressure has dropped. The usual lack of thrift. The opposite situation can be seen in the summer season. In summer the sun overheats pipes up to 60 degrees and more. The gas pressure in the gas supply pipe now increases. From all the cracks and joints of gas pipes, leaky welding and corroded gas pipes, "free" gas leaks out, which sometimes can even accumulate somewhere and cause an explosion or fire. In addition, metal pipes that leak gas require difficult installation, expensive welding. The metal itself also costs a tremendous amount of money and requires systematic painting with oil-based paint to protect against corrosion. Painting is labor and paint consumption. Energy-saving technology is also needed here. Everybody knows such a physical quantity as thermal conductivity. It is also

known that the thermal conductivity of polymers is several times lower than that of metal. Metal pipes for gas transport began to be used due to the fact that natural gas belongs to the class of explosive compounds. The decision to transport natural gas using metal pipes was made universally at the very beginning of the era of using gas as a source of thermal energy. Since then more than a decade has passed, many innovations in the production of polymeric materials have been made. Modern polymer production technology can offer an alternative to metal in many respects, including the tensile strength. The same can be said, incidentally, about the cost of materials. In our age of chemistry and polymers, with a huge variety of polymers, would it not be easier to replace the gas pipes everywhere by a polymer with a thermal insulating coating. Then in winter the gas pressure will not drop and there will be no need to supply excessive gas to the gas lines and consume it in excess of the norm at times.

The same is true in all areas of energy consumption. Consider space heating with water heating. As a rule, the registers are installed close to the walls, under the windows of residential and industrial premises. Let's compare the thermal conductivity of concrete and air. Here, without citing theories of heat transfer, without recalling entropy and other physical quantities, simply by way of common sense, let's ask the question, how will the heat register of the heating system be spent? First and foremost, concrete, with its enormous thermal conductivity, will be warmed. And this concrete will heat the street, and only partially the dwelling. The air in the room, which has low thermal conductivity and heat capacity, will be heated insignificantly. It will take a considerable amount of time to heat the room by convection. But everyone knows that heat spreads by convection, conduction and radiant exchange. Fixing an infrared reflective foil coating on the wall behind the radiator will save up to 50% of the house heat. And in general, such a problem of energy saving is, of course, addressed to the construction heat engineering and architecture of buildings. But, unfortunately, it is not yet implemented in practice. Perhaps design considerations come first, rather than considerations of comfort and economy. Based on the principle of reflecting infrared radiation and heat preservation, modern reflector heaters have been developed that are low energy consuming and reflect heat evenly (photo 1).

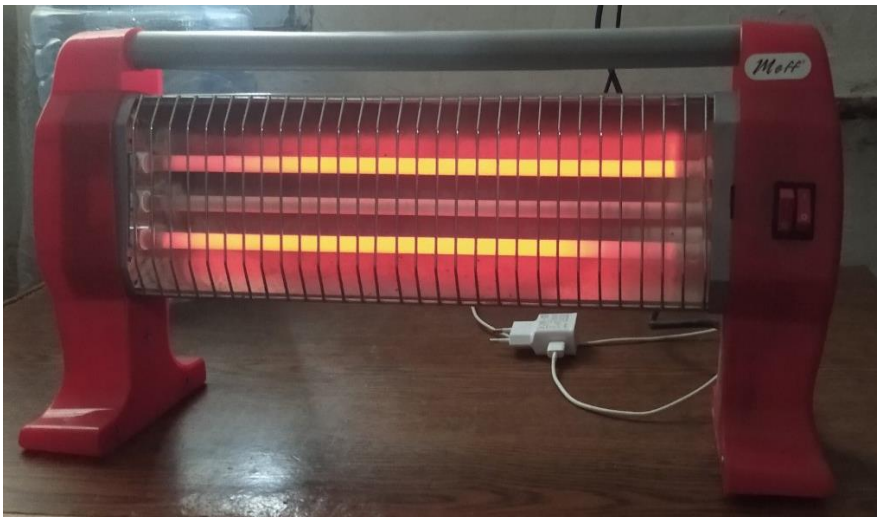

Photo 1. Heat reflective foil electric heaters.

The issue of energy conservation is also very relevant, because it is possible to produce energy and waste it to infinity. Spending energy while polluting the environment. The developers of modern energy-consuming equipment should be faced with the urgent task of designing low-

energy-consuming equipment. Here we should think about mass production of rechargeable batteries based on super capacitors. Of course, they are still low-power, have low efficiency, but we know how to use step-up transformers and various combinations of parallel serial connections of current sources. Such capacitors are the development of modern nanotechnology, using super surfaces. The means of modern circuitry allows us to calculate such connections to achieve the highest current efficiency. The use of super capacitors will also allow a gradual transition from gasoline, gas and diesel engines to electric motors and electric vehicles, which is very relevant nowadays.

RESULTS

There are many papers and studies devoted to the problem of energy conservation. In a small publication it is difficult to give voluminous results. Here we have to limit ourselves to a simple result of heat and gas saving through the use of foil insulators in the home. The use of foil-coatings (foil-ash) behind the registers of heating system in the laboratory room allowed to increase the air temperature in the room of 46 square meters from 18 to 27.5 degrees Celsius during the experiment which comprised only two academic hours. That's 28%! The use of foil insulation helped to keep the temperature of the 20 meter section of the gas pipe at 4 degrees Celsius, when the ambient temperature was -5 degrees Celsius. Temperatures were measured using both a thermocouple and a thermal imager. At the same time, the gas pressure supplied to the thermally insulated sections increased significantly. The experiments were repeated with good reproducibility.

DISCUSSION

In wintertime a great amount of heat and electric energy is used for heating and heating as well as in summertime when it is necessary to cool the building. The application of a set of simple economic measures and the use of modern low-cost materials can greatly reduce the largest items of energy consumption - for heating, hot water and air conditioning. When constructing and designing buildings and supply systems it is necessary to take into account not only architectural and construction solutions, but also seasonal and climatic, energy-saving solutions. The energy and household appliances of the future must become low-consumption and efficient, and such trends are emerging.

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