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ИСПОЛЬЗОВАНИЕ ХОЛОДНОГО ЯДЕРНОГО СИНТЕЗА ДЛЯ ОТОПЛЕНИЯ ЗДАНИЙ И СООРУЖЕНИЙ

THE USE OF COLD NUCLEAR FUSION FOR HEATING BUILDINGS AND STRUCTURES

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Аннотация

Строительство зданий зародилось вместе с человеком и так же развивалось. Человек создавал для своего бытия и работы самые разные сооружения, обустраивая помещения для решения определённых задач. И, сталкиваясь с проблемами благоустройства, проектировал новые системы, одной из первых данных систем стала отопительная система. Она была индуцирована для воспроизведения и поддержания тепла в зданиях и сооружениях, с целью сохранения мебели и прочих предметов утвари, а также здоровья самого человека. Современные жилые и нежилые здания сложно представить без оборудования и приборов, создающих комфортную климатическую среду. И эта отрасль инженерных систем развивается с течением времени все быстрее. Однако, не каждый знает о том, что отопление зданий и сооружений может быть более выгодным.

Методология анализа

Холодный ядерный синтез для отопления зданий и сооружений: *в данной работе рассмотрено использование холодного ядерного синтеза, называемого кавитацией, для отопления зданий и сооружений. Проведен анализ видов теплогенератора, разобраны все преимущества и недостатки. Рассмотрены также условия установки и использования кавитационных теплогенераторов.*

Результаты и обсуждения *в результате проделанной работы можно сделать вывод, что использование холодного ядерного синтеза (кавитации) при помощи кавитационных теплогенераторов различных видов более экономически выгодное, экологическое, безопасное и удобное, в сравнении со стандартным оборудованием отопления. Из приведенных разновидностей теплогенераторов выбран самый комфортабельный относительно использования и обслуживания. Также, в результате изучения работы теплогенераторов было выведено, что помимо отопления здания или сооружения данная установка может обогревать проточную воду, используемую в быту для различных целей.*

Заключение: Можно сделать вывод, что холодный ядерный синтез (кавитация) при использовании его в бытовой среде, а конкретнее в отоплении зданий и сооружений является не только дешевым в установке и эксплуатации, но и экологичным и безопасным для здоровья человека.

Ключевые слова: кавитация, теплогенератор, кавитационный теплогенератор, роторный теплогенератор, статический теплогенератор, ультразвуковой теплогенератор, теплогенератор Потапова, отопление, здание, сооружение

Abstract

Introduction: *The construction of buildings originated with man and developed in the same way. Man created a variety of structures for his being and work, equipping premises to solve certain problems. And, faced with the problems of improvement, he designed new systems, one of the first of these systems was the heating system. It was induced to reproduce and maintain heat in buildings and structures, in order to preserve furniture and other utensils, as well as the health of the person himself. It is difficult to imagine modern residential and non-residential buildings without equipment and appliances that create a comfortable climatic environment. And this branch of engineering* *systems is developing faster and faster over time. However, not everyone knows that heating buildings and structures can be more profitable.*

Cold fusion for heating buildings and structures: *This paper discusses the use of cold fusion, called cavitation, for heating buildings and structures. An analysis of the types of heat generator was carried out, all the advantages and disadvantages were analyzed. The conditions for the installation and use of cavitation heat generators are also considered.*

Results: *as a result of the work done, it can be concluded that the use of cold nuclear fusion (cavitation) using various types of cavitation heat generators is more cost-effective, environmentally friendly, safe and convenient, in comparison with standard heating equipment. Of the above varieties of heat generators, the most comfortable in terms of use and maintenance was selected. Also, as a result of studying the operation of heat generators, it was concluded that in addition to heating a building or structure, this installation can heat running water used in everyday life for various purposes.*

Conclusion: *It can be concluded that cold nuclear fusion (cavitation) when used in a domestic environment, and more specifically in heating buildings and structures, is not only cheap to install and operate, but also environmentally friendly and safe for human health.*

Keywords: cavitation, heat generator, cavitation heat generator, rotary heat generator, static heat generator, ultrasonic heat generator, Potapov heat generator, heating, building, structure

Introduction

Today's district heating and heat supply, as well as the modern concept of heat, are closely connected with the development of Russian scientific and engineering thought. Thanks to the work of domestic scientists and engineers, an independent way of forming heat supply in Russia was formed, different from Western Europe.

There is no factual data in history about when exactly a person began to switch to any organized methods of heating his home and those or other public buildings that had already arisen.

Indications and material confirmations of more advanced heating technologies refer to eras relatively close to us.

These confirmations are charcoal braziers found in a fairly significant number and in a wide variety of countries. Without, of course, having no idea about the chemical reactions of combustion and the chemical composition of the products of combustion, the ancient man exclusively by experience verified the safety of burning charcoal naturally in a heated room with the release of combustion products directly into this latter.

And indeed, as we know it today for certain, with a uniform influx of atmosphere to a thin cover of smoldering, well-burnt, charcoal, the product of combustion is only relatively harmless and odorless carbonic anhydride (carbon dioxide, $CO2$). It is extremely curious that this, from our point of view, primitive method of heating had such a coefficient of efficiency that we can only dream of in our current heating systems, because a charcoal brazier, in which all the calorific value of coal was absolutely used, efficiency was equal to 1, – in relation, of course, to charcoal, and not to the tree from which this coal was obtained.

This method of space heating earned a very extensive and very long-lasting distribution, covering, apparently, the entire European mainland and far Asia with China and Japan.

Being an indoor heating device, heating, of course, the premises of wealthy dignitaries and nobles, these braziers have achieved a high degree of figurative perfection: they were made from the best bronze. This is evidenced by the bronze braziers found in Pompeii. Thus, a Roman bronze tripod brazier with a diameter of 500 mm, a depth of 120 mm and a height of 1000 mm could heat a room with a heat loss of about 10 kcal / h, i.e. a cubic capacity of approximately 1000 m3.

We meet the initial signs of a more organized heating of buildings about 2200 years ago, that is, in the last centuries BC.

Archaeological excavations in the territories of present-day Italy, France, Switzerland, Germany and England open before us a picture of quite impressive achievements in those days in the field of heating, and even ventilation of buildings. These are scarlet heating systems with illegal chambers, invented, no doubt, by the Romans several centuries before our era. Despite the Roman invention, these heating systems bear the Greek name "hyupokaustum", meaning "warmed from below".

The room, heated by “hyupocausts”, had an underground covered along columns of stone or pottery pipes with clay slabs 50 mm thick, over which a continuous grease 150 mm thick was made. In this design there was a manhole, obviously for cleaning and repair, which was closed with a sandstone slab. This underground was intended as a continuous chimney for the hearth, which was outside the building in a recess in the ground. In the wall of this recess there was a furnace for burning charcoal. The underground channel, which led the hot products of coal combustion into the underground, left the last to the first row of brick columns. The shape of this channel in the project is unique, since it has two expansions and narrowings alternately placed. In the first of them, closest to the furnace recess, coal was obviously burned. An external air intake opening was intended to regulate the heating intensity of the underground and to heat the heated room itself. Outside air flowed through it into the underground room and from there through the opening into the hypocaustum itself. Here he was deflected by the rebound in order, apparently, to best mix with the hot gases coming from the coal furnace. The hole was covered with a clay slab in order to regulate the inflow of outside air. The same building, together with a chimney-like hail and ceramic channels coming from it, which probably (the wall was preserved only to a height of 1 m) above the roof, served as a supply and exhaust ventilation system after the burning of coal in the furnace ceased. With similar systems, the Romans heated both in their homeland and in more northern countries, their colonies, such as: in present-day France, Switzerland, Germany, England, both residential, civilian, and various kinds of military buildings of their military settlements and fortresses ("castellum").

Heating with an open fireplace using a chimney was available already in 820 in the monastery of St. Gallen (in Switzerland), as evidenced by the found plans of this monastery with the above date.

Subsequently, in the history of the formation of technologies and systems for heating buildings, the era of centralized systems is due, however, all types of previously used heating devices continued to exist simultaneously and very invariably did not give up their firmly occupied positions. After all, in essence, heating by underground fire and smoke channels is still alive today in the form of heating by hogs in simple greenhouses and greenhouses. By the way, it is interesting that all the centralized heating systems that appeared approximately alternately emerged and at first existed almost unlimitedly for the purpose of heating greenhouses and greenhouses and very slowly penetrated into residential and public buildings, where the old woman is a brick oven, continuing to improve and decorate in appearance , diligently held the place she won.

The first elements of centralized heating found their way into the water system. Rather, such elements are not a heating system, but the principle of its operation, which formed the basis for many centuries after the invented water heating system. These primary elements were found during archaeological excavations of the Roman city of Pompeii, which disappeared near the city of Herculaneum from the eruption of Vesuvius. Here we are talking about a circulating water-heating device for the hot baths so beloved by the Romans, discovered in one of the open villas. In this device we meet all the main elements of the circulating water system.

The next in time of occurrence was the air heating system, which stood out from the same air systems of Roman hypocausts and German fire-stone furnaces in that here the air, heated and supplied to heated rooms, washed the outer planes of a specific air-heating furnace, without coming into contact with those surfaces of the furnace that were washed by the products of combustion of fuel. Such a system provided not only hygienic, but also significant technical progress, since it increased the likelihood of heating the premises during the period of fuel combustion.

The first integrated heating system (high pressure steam) originated in 1818 in England for several greenhouses. But a full and clear awareness of the very great technical and economic benefits arising from the enlargement of the boiler industry for both power and heating needs was first awakened in the United States of America. There, in Lockport, New York, already in 1878, the first local heating plant of an urban scale arose, supplying its subscribers with steam through underground pipelines. Later, with the transfer of power plants far beyond the city limits, specifically to the locations of coal and other natural fuel options (and with the emergence of electricity transport for many hundreds of kilometers), it became impossible to provide cities with thermal energy from such remote steam power stations. This gave impetus, on the one hand, to the construction in the cities of America of central powerful simple thermal stations (steam boilers), on the other hand, to the use of boiler units of liquidated intracity power plants to provide consumers with ready-made thermal energy. But at the same time, the very nature of the growth of American cities, in which streets and entire neighborhoods were built up at once in the shortest possible moment, made it possible to adapt the regional heat supply system and the type of heat carrier (hot water, steam) to the needs of consumers. This occupation was also very favorably aided by the division of cities adopted in America into residential, commercial, administrative, and industrial zones. The first ones usually use water, and the last two-steam heating systems.

In the USSR, the first steps in the field of urban heat supply date back to 1924. We had heat supply for groups of buildings of one household from a common boiler house or even a combined heat and power plant much earlier. So, for example, built on the initiative of prof. Dmitriev in 1913, the steam-water heating and ventilation system of the Pavilion Polyclinic. Mechnikov in Leningrad (formerly the hospital of Peter the Great) functioned immediately after its construction from its combined heat and power plant on the exhaust steam of a steam turbine of an electric generator.

The first city heat pipeline was laid in Leningrad in 1924 from the 3rd state. a galvanic station for supplying hot water to neighboring bathhouses in Kazachyi Lane and for heating the upper (6th) floor of a residential building also nearby. The following year, the buildings of the hospital named after V.I. Nechaev (former Obukhov hospital) on the other side of the Vvedensky Canal.

However, at present we use classical energy sources, which, even in the simplest version and with minimal heat loss of a building or structure, require significant costs, when alternative sources of relatively inexpensive energy have been known for many years.

This article will consider an alternative source of thermal energy using a variety of cold nuclear fusion, and for this you need to figure out which type will be used.

According to Christopher Brennen's definition: “When a liquid is subjected to a pressure below the threshold (tensile stress), then the integrity of its flow is broken and vapor cavities are formed. This phenomenon is called cavitation, it is also considered cold nuclear fusion.

Cavitation is the formation of air bubbles in the water column, caused by the force of the vortex energy of the water flow. The formation of bubbles is always accompanied by a certain sound and the formation of some energy as a result of their impact at high speed. Bubbles are cavities in water filled with evaporation from the water in which they themselves formed. The fluid exerts a constant pressure on the bubble, so it tends to move from an area of high pressure to an area of low pressure in order to survive. As a result, it cannot withstand the pressure and abruptly shrinks or "breaks", spraying out energy that creates a wave.

The "explosive" energy of a large number of bubbles is so powerful that it can destroy impressive metal structures. This is the energy that serves as an extra when heated. In the case of a heat generator, a completely closed circuit is provided, in which bubbles of very small sizes are formed, bursting in the water column. They do not have such destructive power, but provide an increase in thermal energy up to 80%. The system supports AC current up to 220V while maintaining the integrity of the electrons critical to the process.

As already mentioned, the operation of a thermal installation requires the creation of a "water vortex". This is the responsibility of the pump built into the heating system, which generates the required level of pressure and forces it to force it into the working tank. During the occurrence of turbulence in water, some changes occur in the mechanical energy in the liquid body. As a result, it starts to set the same temperature. Additional energy is created, according to Einstein, when a certain mass is converted into the necessary heat, the whole process is accompanied by cold nuclear fusion.

Then the question arises of how to use this reaction for heating. At the moment, one method is already known – devices with a fundamentally different type of effect on the coolant are used. Such devices include a cavitation heat generator, the work of which is to form gas bubbles, due to which heat is released.

The principle of operation of a cavitation heat generator is the heating effect due to the conversion of mechanical energy into thermal energy. Now let's take a closer look at the cavitation phenomenon itself. When excess pressure is created in a liquid, turbulence occurs, due to the fact that the pressure of the liquid is greater than that of the gas contained in it, the gas molecules are released into separate inclusions – the collapse of the bubbles. Due to the pressure difference, water tends to compress the gas bubble, which accumulates a large amount of energy on its surface, and the temperature inside reaches about 1000 – 1200ºC.

When the cavitation cavities pass into the zone of normal pressure, the bubbles are destroyed, and the energy from their destruction is released into the surrounding space. Due to which, thermal energy is released, and the liquid is heated from the vortex flow. The operation of thermal generators is based on this principle, then consider the principle of operation of the simplest version of the cavitation heater m – When the water flow reaches the nozzle, the liquid pressure increases significantly and the formation of cavitation bubbles begins. When the bubbles exit the nozzle, they release heat power, and the pressure after passing through the nozzle is significantly reduced. In practice, multiple nozzles or tubes may be installed to increase efficiency. (Figure 1.)

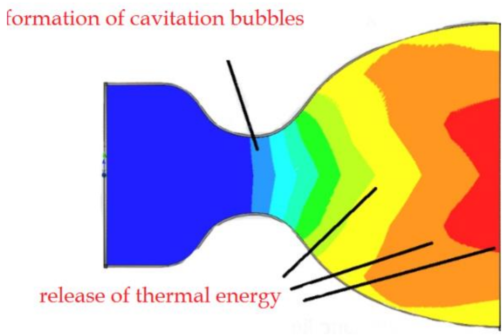

Figure 2. The principle of operation of the cavitation heat generator

The main task of a cavitation heat generator is the formation of gas inclusions, and the quality of heating will depend on their quantity and intensity. In modern industry, there are several types of such heat generators, which differ in the principle of generating bubbles in a liquid. The most common are three types:

The working element rotates due to the electric drive and generates fluid turbulence. It consists of an electric motor, the shaft of which is connected to a rotary mechanism designed to create turbulence in the liquid. A feature of the rotor design is a sealed stator, in which heating occurs. The stator itself has a cylindrical cavity inside – a vortex chamber in which the rotor rotates.

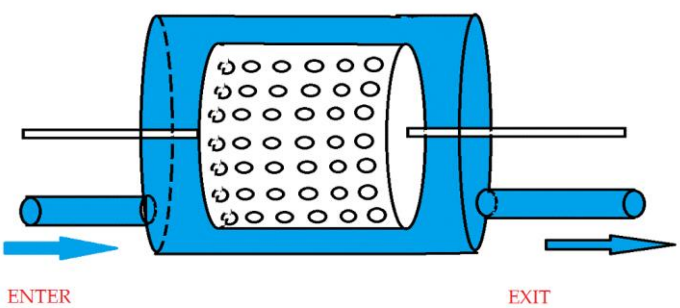

Figure 3. The design of the rotary heat generator

The rotor of a cavitation heat generator is a cylinder with a set of recesses on the surface, when the cylinder rotates inside the stator, these recesses create heterogeneity in the water and cause cavitation processes to occur. The number of recesses and their geometric parameters are determined depending on the model of the vortex heat generator. For optimal heating parameters, the distance between the rotor and the stator is about 1.5 mm. Rotor cells are needed so that in the thickness of the liquid jet, which constantly rubs against the surface of the movable and static cylinder, turbulences arise to form cavitation cavities. In the same gap, the liquid is heated. For the efficient operation of the heat generator, the transverse dimension of the rotor must be at least 30 cm, while the rotation speed of 3000 revolutions per minute is determined. If you make the rotor of a smaller diameter, then you should increase the number of revolutions. For all the seeming simplicity, the development of a clear action of all parts of the rotary heat generator requires quite accurate, including balancing the movable cylinder. The sealing of the rotor shaft is needed with the constant replacement of failed insulating materials. The efficiency of such generators is not impressive, the work is accompanied by a noise effect. Their service life is short, although they work 25% more productively than static models of heat generators;

Tubular – change the pressure due to a system of pipes through which water moves. A static heat generator does not have rotating elements. The heating process in them occurs due to the movement of water through pipes tapering in length or due to the installation of Laval nozzles. The water supply to the working body is carried out by a hydrodynamic pump, which creates a mechanical force of the liquid in a narrowing space, and when it passes into a wider cavity, cavitation turbulences occur. Unlike the previous model, tubular heating equipment does not produce much noise and does not wear out so quickly. During installation and operation, you do not need to worry about precise balancing, and if the heating elements are destroyed, their replacement and repair will be much cheaper than for rotary models. The disadvantages of tubular heat generators include significantly lower productivity and bulky dimensions;

Static generator pump – to create cavitation processes in a liquid, a design of nozzles is used. Recreating the phenomenon of cavitation requires a high speed of water movement, for which a powerful centrifugal pump is used. The pump applies increased pressure to the flow of water, which rushes into the inlet of the nozzle. The outlet diameter of the nozzle is much narrower than the previous one and the liquid receives additional energy of movement, its speed increases. At the outlet of the nozzle, due to the rapid expansion of water, cavitation effects are obtained with the formation of gas cavities inside the liquid body. Water heating occurs according to the same principle as in the rotary model, only the efficiency is somewhat reduced. Static heat generators have a number of advantages over rotary models:

- The design of the stator device does not require fundamentally precise balancing and fitting of parts;
- Mechanical preparatory operation does not require precise grinding;
- Due to the absence of moving parts, sealing materials wear out much less;
- The operation of the equipment is longer;
- In the conditions of the nozzle becoming unusable, its replacement will require less costs than in the rotary version of the heat generator, which needs to be recreated
- It can provide a large temperature difference at the hot and cold ends, operate at low pressure.
- Efficiency not less than 90%.
- Never overheats.
- Fire and explosion proof. Can be used in explosive environments.
- Provides fast and efficient heating of the entire system.
- Can be used for both heating and cooling.

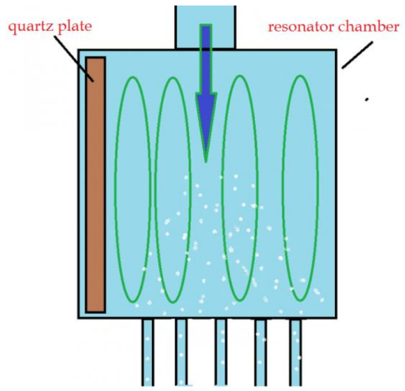

Figure 4. The principle of operation of the ultrasonic heat generator

Ultrasonic (Figure 3.) – fluid inhomogeneity in such heat generators is created due to low-frequency sound vibrations. This type of device has a resonator chamber tuned to a certain frequency of sound vibrations. A quartz plate is installed at its input, which produces oscillations when electrical signals are applied. The vibration of the plate creates a wave effect inside the liquid, which reaches the walls of the resonator chamber and is reflected. During the return motion, the waves meet with direct oscillations and create hydrodynamic cavitation. Further, the bubbles are carried away by the water flow through the narrow inlet pipes of the thermal installation. When passing to a wide area, the bubbles are destroyed, releasing thermal energy. Ultrasonic cavitation generators also have good performance, as they do not have rotating elements.

Popular and more studied is the invention of Potapov's heat generator (Figure 4.). It is considered a static device.

The pressure force in the system is created by a centrifugal pump. A jet of water is fed with high pressure into the snail. The liquid begins to warm up due to rotation along the curved channel. She enters the vortex tube. The footage of the pipe must be ten times greater than the width, as shown in the first figure of the principle of operation of the heat generator.

Water passes along the spiral spiral located along the walls. Next, a brake device was installed to remove part of the hot water. The jet is slightly leveled by plates attached to the sleeve. Inside there is an empty space connected to another braking device.

High temperature water rises and a cold swirling fluid flow descends through the interior. The cold flow comes into contact with the hot flow through the plates on the sleeve and heats up.

Warm water descends to the lower brake ring and is further heated by cavitation. The heated flow from the lower braking device passes through the bypass to the outlet pipe.

The upper brake ring has a passage whose diameter is equal to the diameter of the vortex tube. Thanks to him, hot water can get into the pipe. There is a mixing of hot and warm flow. Further, the water is used for its intended purpose. Usually for space heating or domestic needs. The return is connected to the pump. Branch pipe – to the entrance to the heating system of the house.

To install the Potapov heat generator, diagonal wiring is required. Hot coolant must be supplied to the upper course of the battery, and cold will come out of the lower one.

Having dealt with the operation of heat generators, it is worth considering the very principle of heating with the help of cavitation.

The pump increases the water pressure and delivers it to the working chamber, the pipe of which is connected to it by means of a flange.

In the working body, the water must receive increased speed and pressure, which is carried out using pipes of various diameters, tapering along the flow. In the center of the working chamber, several pressure flows are mixed, leading to the phenomenon of cavitation.

In order to be able to control the speed characteristics of the water flow, braking devices are installed at the outlet and during the working cavity.

Water moves to the branch pipe at the opposite end of the chamber, from where it flows in the return direction for reuse by means of a circulation pump. Heating and heat generation occurs due to the movement and sharp expansion of the liquid at the outlet of the narrow nozzle opening.

Having dealt with the types of heat generators and their principles of operation, the question arises: How much more advantageous is this than varieties of standard heating.

The task of economical heating of water, which is used as a heat carrier in water heating and hot water supply systems, has been and remains important regardless of how these processes are carried out, the design of the heating system and heat production sources. There are four main types of heat sources for this task:

- Physical and chemical (combustion of fossil fuels: oil products, gas, coal, firewood and the use of other exothermic chemical reactions);
- Electricity, when heat is generated by components in an electrical circuit that have a sufficiently high ohmic resistance;
- A fusion based on the use of heat from the decay of radioactive materials or the synthesis of heavy hydrogen nuclei, including those found in the Sun and deep in the earth's crust;
- Mechanical, when heat is generated by surface or internal friction of materials. It should be noted that the property of friction is inherent not only in solids, but also in liquids and gases.

The rational choice of the heating system is influenced by many factors:

- Presence of specific fuel
- Environmental aspects, design and architectural solutions,
- The volume of the building under construction,
- Financial capabilities of a person and much more.

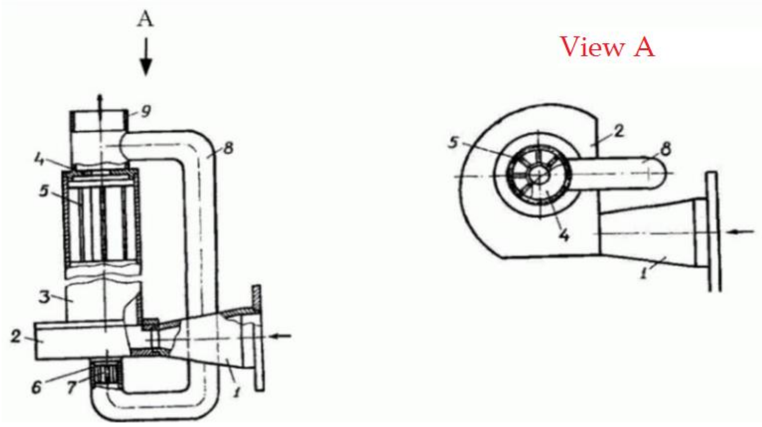

Figure 4. Scheme of the generator device. 1 – Branch pipe, 2 – Volute, 3 – Whirlpool pipe, 4 – Upper brake, 5 – Water rectifier, 6 – Coupling, 7 – Lower brake ring, 8 – Bypass, 9 – Branch line.

1. Electric boiler – all boilers must be purchased with a power reserve (+ 20%) due to heat loss. They are fairly easy to maintain, but require a decent power supply. This requires connecting a powerful power cable, which is not always realistic outside the city.

Electricity is an expensive form of fuel. Payment for electricity very quickly (after one season) exceeds the cost of the boiler itself.

2. Electric heaters (air, oil, etc.) are easy to maintain.

Very uneven space heating. Rapid cooling of the heated space. High power consumption. The constant presence of a person in an electric field, breathing superheated air. Low service life. In many regions, payment for electricity used for heating occurs with a growth factor of K = 1.7.

3. Electric underfloor heating – the complexity and high cost of installation.

It is not enough to heat the room on cold days. The use of a high-strength heating element (nichrome, tungsten) in the cable provides good heat dissipation. Simply put, the carpet on the floor will create conditions for overheating and failure of this heating system. When using tiles on the floor, the concrete screed must be completely dry. In other words, the first safe trial run of the system takes at least 45 days. The constant presence of a person in an electric and / or electromagnetic field. Significant energy consumption.

4. Gas boiler – significant initial costs. Design, permits, gas supply from the gas pipeline to the house, a special room for the boiler, ventilation, etc. other. The negative pressure of pressurized gas affects operation. Poor-quality liquid fuel leads to premature wear of the components and assemblies of the system. Environmental pollution. High prices for services.

5. Diesel boiler – there is the most expensive installation. Additionally, it is required to install tanks for several tons of fuel. Availability of access roads to the tanker. Ecological problem. Dangerous. Dear service.

6. Electric generators – requires professional installation. Extremely dangerous. Mandatory grounding of all metal heating elements. High risk of electric shock in the event of the slightest failure. They require the unpredictable addition of alkaline components to the system. There is no stability at work.

The trend in the development of heat sources is moving towards the transition to environmentally friendly technologies, among which electricity is currently the most common.

And yet, now we will consider separately all the advantages of a cavitation heat generator:

The most obvious advantage of heat generators is the rather simple maintenance, despite the possibility of free installation without special permission from the power grid staff. Once every six months, it is enough to check the friction of the parts of the device – bearings and seals. At the same time, according to suppliers, the average guaranteed service life is up to 15 years or more.

The Potapov heat generator is completely safe and safe for the environment and users. Environmental friendliness is justified by the fact that during the operation of a cavitation heat generator, emissions of harmful products during the processing of natural gas, solid fuel and diesel fuel are excluded. They are simply not used.

Makeup comes from the net. Ignition due to lack of contact with an open flame is excluded. Additional safety is provided by the instrument panel of the device, which is used to control all processes of temperature and pressure changes in the system.

The economic efficiency of space heating with heat generators is expressed in several advantages. Firstly, you don't have to worry about the quality of the water when it plays the role of a coolant. One should not think that this harms the entire system only because of its poor quality. Secondly, there is no need to make financial investments in the organization, laying and maintenance of thermal routes. Thirdly, water heating according to physical laws and the use of cavitation and vortex flows completely eliminate the appearance of calcium stones on the internal walls of the installation. Fourthly, cash costs for transportation, storage and purchase of previously required fuel materials (natural coal, solid fuel, oil products) are excluded.

The undeniable advantage of heat generators for home use is their unique versatility. The scope of use of heat generators in everyday life is very wide:

- As a result of passing through the system, water is transformed, structured, and pathogenic microorganisms die under such conditions;
- Water from the heat generator can be watered with plants, which will contribute to their rapid growth;
- The heat generator is capable of heating water to a temperature above the boiling point;
- The heat generator can interact with already used systems or be built into a new heating system;
- The heat generator has long been used by people who are aware of it as the main element of the heating system in homes;
- The heat generator easily and at no extra cost prepares hot water for domestic use;
- The heat generator can heat liquids used for various purposes, in addition to heating, for example: heating running water, which is used in everyday life. A heat generator that is connected to the network can heat water quite quickly. As a result, such equipment can be

successfully used for heating water in swimming pools, autonomous water supply, saunas, and laundries.

Attention should be paid to the ability of heat generators to work completely autonomously. This means that the intensity mode of its work can be set independently. In addition, all heat generator projects are very easy to install. There is no need to involve employees of service organizations, all installation operations can be performed independently.

The cavitation heat generator can be made in several versions. Therefore, you need to choose such a device for heating your home, taking into account a number of parameters:

- It is necessary to select a heat generator based on the area for which heating is needed. You should also consider what kind of weather is observed in winter. An important characteristic will be the thermal insulation of the walls. That is, you need to choose a device that will provide the required amount of heat.
- If you purchase a standard installation (rotary heat generator), then it is necessary that it be equipped with devices for controlling the generated heat and protection sensors. It is better to install immediately with an automatic control and management unit.
- If the equipment is purchased separately, it is important to determine the features of all elements of the system. The pump must be able to handle liquids that are heated to high temperatures. Otherwise, the system will quickly become unusable and will have to be repaired. In addition, the pump must provide pressure from 4 atmospheres.

Results

As a result of the work done, it can be concluded that the use of cold nuclear fusion (cavitation) during the operation of a cavitation heat generator is cost–effective, environmentally normalized, safe and convenient for heating buildings and various structures. Also, this installation during the study showed that the use of cavitation significantly exceeds the characteristics of standard heating methods. Depending on the building or structure, you can choose the types of cavitation heat generators:

- Rotary;
- Tubular;
- Ultrasonic;
- Statistical;
- Potapov's heat generator.

To introduce cavitation for heating and heating running water of a building and / or structure, it is necessary to build on the thermal insulation, the area of \u200b\u200bthe room and the region in which the object is located. If you choose the right installation of a cavitation heat generator, then heating and water heating will not bring a lot of costs and inconvenience, increasing the efficiency over 90%.

Conclusion

In the course of the studies on the operation of cavitation heat generators, as well as the analysis of cold nuclear fusion, it can be concluded that the use of cavitation for heating buildings and structures is a profitable and comfortable solution. This is due to the following benefits:

- The design of the stator device does not require fundamentally precise balancing and fitting of parts;
- Mechanical preparatory operation does not require precise grinding;
- Due to the absence of moving parts, sealing materials wear out much less;
- Equipment operation is longer, up to 5 years;
- In the conditions of the nozzle becoming unusable, its replacement will require less costs than in the rotary version of the heat generator, which needs to be recreated
- It can provide a large temperature difference at the hot and cold ends, operate at low pressure.

- Efficiency not less than 90%.
- Never overheats.
- Fire and explosion proof. Can be used in explosive environments.
- Provides fast and efficient heating of the entire system.
- Can be used for both heating and cooling.

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