LOW TEMPERATURES THERMAL ENERGY – A HUGE MARKET AND POTENTIAL ENVIRONMENTALLY FRIENDLY

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Abstract:

In everyday life, the concept of thermal energy is associated, in outlook, with areas or facilities which are distinguished by relatively high temperatures. In the shadow of this perception, we are tempted to not see the quantities of heat that benefits all of us, for personal convenience or for carrying some activities. The reason for this negligence is that the heat enter our lives at relatively low temperatures, which is not perceived as dangerous. Required amount of heat at low temperature are huge and are largely obtained on account of adequate fossil fuels quantity burning. This conduct can not be considered environmentally friendly because, on the one hand, leads to high rates of diminishing fuel reserves and, on the other hand, increase the rates in which terrestrial atmosphere is loaded with fossil carbon. However, "Mother Nature" is generous and gives us the opportunity to obtain large amounts of heat through smart exploitation of local resources present practically in any area.
This work aims to analyze the thermal energy at low temperature consumption under three aspects. The first of these concerns the structure and dimensions of the particular market. The second issue concerns the "supply" of available heat in the environment. Finally, the third aspect concerns the technical possibilities available for an intelligent exploitation of natural heat supply to cover a portion of alleged market.

1. INTRODUCTION

As „**low temperature heat**" will identify below any amount of heat contained in a heat medium whose temperature is lower than **373.15 K (100 ° C)**, regardless of process heat it is involved.

In terms of absolute energy potential, low temperature heat is possible to classified as „the most degenerate form of energy" and this ranking requires some clarification and comments.

Generally, heat is classified as a form of "degenerate" energy because, on the one hand, all processes in nature are accompanied by transformation, in proportions and at different rates, of some other forms of energy (mechanical, electrical, chemical, nuclear etc..) into heat and, on the other hand, the absolute energy potential of a quantity of energy, cited above, is formally considered by the possibility of its transformation into other forms of energy and by the level of efficiency of this transformation. Under this latter point, heat have penalty of an

universal natural limitations, postulated by **the second principle of thermodynamics** which, in terms appropriate to this comment, shows that **any amount of heat contain a fraction impossible to convert into another form of energy**. The existence of this fraction is behind ranking heat as "degenerate" energy, and its proportion can serve the formal assessment of "level of degeneration". This assessment can be treated under conceptual or practical aspects related to heat processing in other forms of energy.

2. THE LOW TEMPERATURE HEATING MARKET

Heat at low temperature market has two components with distinct aspects. The first of these consists of residential and is characterized by relatively low consumption, but continuous and diffuse geographic spread. The second component consists of units which require processing heat consumption (in wood and leather processing, agricultural products conditioning and storage activities, food industry, etc.) and can claim significant powers available permanent or seasonal.

The thermal energy to low temperature is in the residential sector, a permanently necessity for domestic hot water preparation. Also, in the case of Romania, which benefits from a temperate continental climate, the thermal energy at low temperature is necessary with annual periodicity the cold season in order to ensure the heating of living spaces. The necessary of heat for heating can be calculated with certain accuracy, the methods of calculation being standardized. For a general overview, in Romania, the at low temperature heat demand in the residential sector is satisfactory to consider the average values used by builders [1] for sizing of heating and hot water (a power of 0.05 kW heating 1 m^3 of site, 50 liters of water heated from 10ºC to 45ºC for one person per day) and statistics on Romania [2] and its climatological regime multi [3]. According to the latter, Romania has about 20 million inhabitants and has 330 million square meters of living area (16.5 m2 / inhabitant) and a cold season average of 165 days / year. Using the data set and considering an average height of 2.8 m for living quarters, simple calculations show that, for a person, the yearly heat at low temperature amounts to 9150 kWh for heating and to 750 kWh for domestic hot water preparation. Therefore, in Romania, the yearly necessary of heat at low temperature in the residential sector, amounts to 9900 kWh / capita. This estimation is confirmed by official statistics [4] which states that in 2010 the centralized heat production systems have delivered a heat quantity of 13.2 billion kWh for 9.355 million inhabitants, which amounts to an average of 1411 kWh / capita. Obviously, the significant difference between the necessary estimated above and the quantity reported as delivered can be put, in the conditions from Romania, on the account of the losses in the transport networks and distribution.

The assessment of specific heat demand at low temperature in the field of small-scale economic activities is more difficult, because the consumptions depends fundamentally of a number of factors with flexible manifestations such as the number of workers, the size of spaces actually used for their activities, the structure and the volume of production, technological approaches, etc. The problem of heat consumption at low temperature for habitat conditioning come

Thus, for the capture and transfer of heat from the solar radiation are commercially available various solutions consisting of boards and systems with high yields.

All the technologies involving the heat extraction from an environment and its delivery to the desired parameters to a user is based on the use of heat pumps. In this area, recent decades have witnessed dramatic increases in performance due to advances in refrigeration and dominions better heat transfer processes. Accordingly, nowadays many variants are commercially available and types of heat pumps extract heat from the media capable of temperatures of –20ºC ... –25ºC temperature and to deliver pertinent heat at low temperature raised above.

Finally, for energy recovery from biomass are many technologies available and appropriate equipment for their application to small-scale locally. Thus, for the direct burning of biomass there are technologies and equipments for the wood waste conditioning (usually chopping) and for the preparation of pellets and briquettes from sawdust and agricultural residues. Also, the technology for the burning of such materials are known and can be applied, with appropriate adaptation sets, even in the existing outbreaks constructed for other solid fuels. In turn, the technologies of preparation, conditioning and recovery of biogas are well mastered and available, even if you still can not speak of a market for small biogas plants. So it is with synthesis gas generators and installations for the extraction of liquid fuels.

Looking at things as a whole, we can say that we have all the technology needed to exploit local renewable energy, and most of the equipment required for this conduct are commercially available.

5. CONCLUSIONS

The foregoing indicates a huge and unsaturated market corresponding to a meaningfully necessary of low temperature heat. Meanwhile, our environment offered, sustainable, enough heat to satisfy that market and technologies for that purpose aren't missing. Therefore, the issues of ensuring low temperature heat demand is less "technical" and more attitude and strategic approach.

Such conclusions are, on the one hand, reassuring to view coverage of the heat at low temperatures of the people but, on the other hand, put in the general conduct of human society.

We, therefore, have enormous and inexhaustible resources of heat - is right, stored at temperatures that are unsuitable for direct acquisition to ensure people's needs. Meanwhile, over one hundred years we have technologies that enable the capture and use of such quantities of heat, and for decades these technologies have become mature even in the most theoretical and practical aspects.

At the same time there - even in the world that are considered „civilized" - major local shortages of heat at low temperatures, translated into the daily life of people through the winter living room well heated no enough, by the lack of comfort offered by domestic hot water, the impossibility of carrying out activities etc.

The last two paragraphs, read carefully, can make anyone to question the human society as a whole acts responsibly. The answer is no, do not act responsibly, but in terms of a short-term economic efficiency. It is commonly known that any system tends to preserve its condition and to make any transition to another state on the path of minimum action (it is a „sui generis" expression of two fundamental principles of science - it's the first law of thermodynamics and the principle of minimal action). Man and human society are, can not even under direct coercion referred laws of nature, the same path of minimal action. How many people would work much of their lives that should not secure daily existence? Would make efforts to organize human societies that would be to ensure the safety of all types, from the food to the same physical adversities of all kinds? Exit motives of minimal action state are not dictated by minimal immediate results but the perception of perspective. As people work any more to accumulate and to ourselves to shelter in a future unpredictable. As a society, begin to work hard to ensure the perpetuation of the living conditions - and under this banner have found all the current efforts on measures to conserve resources and the environment.

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