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Aspects Regarding Renewable Energetic Resources

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Abstract

The paper shows data regarding the possibilities of using some unconventional energetic resources: solar energy, Aeolian energy, tide energy, geothermal energy, thermal water energy, energy of waste resulted from human activity.

***Key words**: renewable energetic resources, aeolian energy, solar energy*

Introduction

The ever increasing consumptions of conventional energetic resources, namely coal and raw oil, as well as the increasingly high costs of them, together with the implicit increase of the pollution level due to their use, require the diversification of the energy market by using cheaper and less polluting energies.

Conventional energetic sources can be replaced by using unconventional energetic sources to a higher extent. In this way there can be reduced significantly the role of the thermoelectric power stations as the main source of producing electric and thermal energy, by converting unconventional energies by using: solar panels, Aeolian generators, system of converting tide energy, heat pumps, biogas.

By developing the use of these systems, there can be obtained low-cost thermal and electric power and in non-polluting installations.

Data Regarding the Conversion of Some Unconventional energies

Solar energy can be converted in various forms of energy, namely: thermal energy, electric power, chemical energy.

The conversion of solar energy into thermal energy can be achieved by means of solar collectors with or without focusing the solar radiation.

Solar collectors without concentration of the solar radiation are the so-called plane collectors (Fig. 1). These collectors have the following advantages: they should not be directed to the sun precisely, they collect both direct and diffuse solar radiation, they have a simple design and low maintenance costs.

The conversion of solar energy is performed by means of the absorbing board where energy is converted into thermal energy and transferred to the fluid that is carried through the coil. The efficiency of the conversion of solar energy into thermal energy (heat) in the solar collector is:

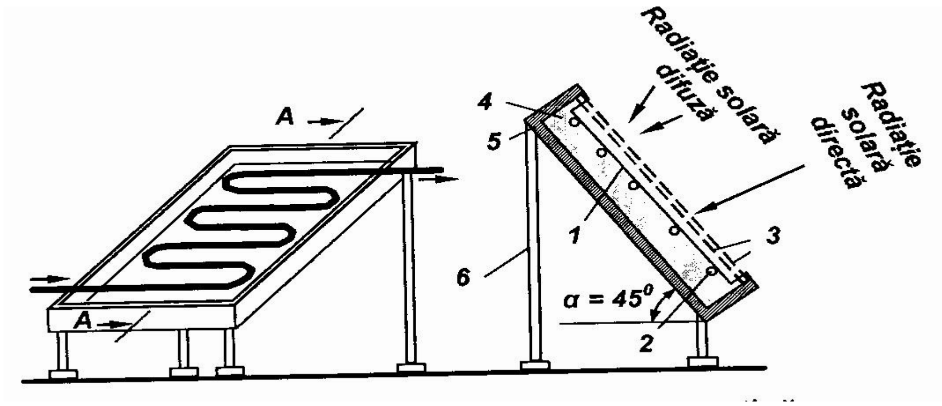


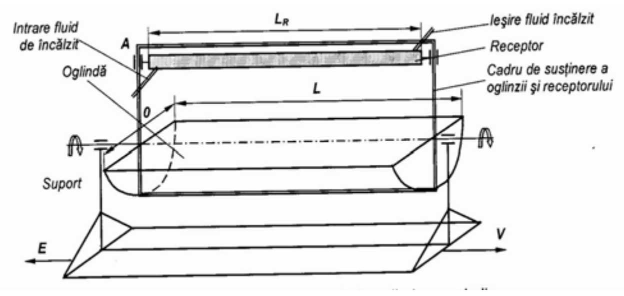
Fig. 1. Plane collector with winding pipe.
1 – absorbing board; 2 – coil for the fluid circulation; 3 – transparent coating;
4 – thermal insulation; 5 – case; 6 - supports

$$\eta = \frac{Q_{su}}{A_c \cdot E \cdot k} \tag{1}$$

in which:

A_c - the area of the absorbing area, m;
E - permissive of the incident radiation, W/m^2;
k - the coefficient of the power released according to the inclination angle of the collector.

Solar collectors with concentration of solar radiation (Fig. 2.) they are provided with refraction or reflection elements of the incident solar radiation, in order to increase the incident emissive power at the collecting surface of the receiver. These solar collectors with concentration of radiation are provided with a monitoring system of the diurnal movement of the sun.



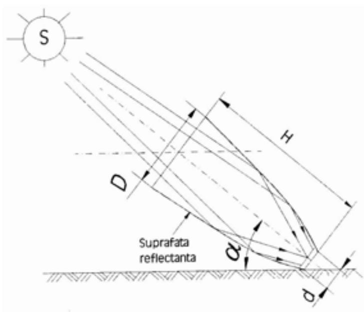


Fig. 2 a) Collector with cylinder – parabolic concentrator. b) Collector with double – parabolic concentrator

The solar radiation focusing ratio, C is the average value of the incident radiation intensity at the collecting surface of the receiver and the intensity of the incident primary radiation at the concentrator surface. The values of this concentrating ratio delimit the types of collectors with concentrators, namely:

- Simple plane collectors ($C \cong 1$);
- Collectors with concentrator type East-West ($C \leq 10$);
- Collectors with linear focusing concentrator ($C \leq 100$);
- Collectors with revolution paralleloid concentrator ($C = 1000$).

The efficiency of the collector with concentrator is:

$$\eta = \frac{Q_u}{A \cdot E} \quad (2)$$

in which:
E – the released power of the incident radiation to the concentrator;
A – the area of the collecting surface of the concentrator, the solar radiation being perpendicular on it.

Solar energy can also be converted into electric power, either in solar piles, or by the vaporisation of water into a collector towards which the solar radiation is focused, as well as the operation of a turbine with the help of the steam obtained.

Such a complex of solar energy converted into electric power, by obtaining overheated vapours used in turbines, with unitary power of 275 MW, is found in the Mojave Desert in California (USA). This is one of the biggest solar energy facilities in the world.

Aeolian energy is an important renewable energetic resources used to produce electric power. The capture and the transformation of Aeolian energy are done by using Aeolian turbines. These are built up in two configurations:

- Aeolian turbines with vertical axis, the axis of rotation being perpendicular on the wind direction (fig. 3);
- Aeolian turbines with horizontal axis, the axis of rotation being parallel with the wind direction (fig. 4);

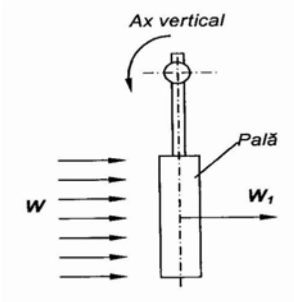


Fig. 3 Aeolian turbine with vertical axis

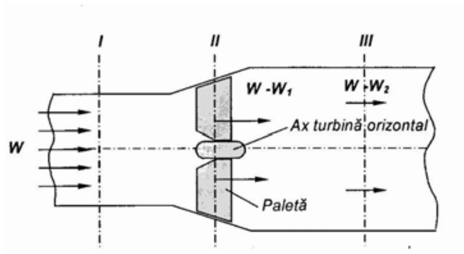


Fig. 4 Aeolian turbine with horizontal axis

The conversion relations of the kinetic energy of the wind into mechanical energy and electric power respectively are:

$$P_{mec} = k \cdot C_p \cdot \lambda \cdot w^3 = \frac{k \cdot C_p \cdot \omega_R^3 \cdot R^3}{\lambda^3} \quad (3)$$

where:

$$k = \frac{\rho \cdot A}{2} \text{ and } \lambda = \frac{\omega_R \cdot R}{w} \quad (4)$$

and where:
C_p - the power factor of the turbine;
λ - the speed transmission ratio;
w - the wind speed;
ω_R - the angular speed of the rotor;
R - the radius of the rotor;
ρ - the specific mass of air;

A - the area of the rotor.

The electric power released is:

$$P_{el} = \eta \cdot \varpi_R \cdot P_{mec} \tag{5}$$

where $\eta \cdot \varpi_R$ represents the efficiency of the generator according to the speed of the rotor.

The specific electric power produced, as it results from (3) varies proportional to the third power of the wind speed (fig. 5).

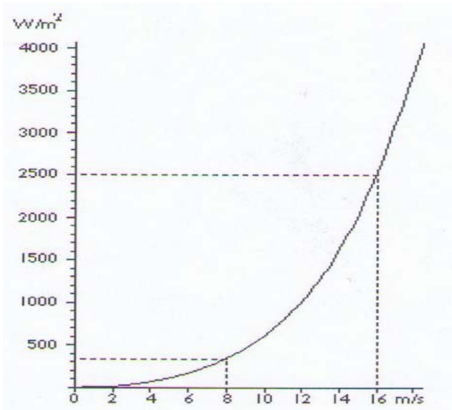


Fig. 5. The quantity of electric power on a certain surface obtained from the conversion of Aeolian energy at various wind speeds

The conversion of Aeolian energy into electric power worldwide is currently achieved to quite a high level. Between 1983 and 2004, the installed capacity increased moderately until 1995, and between 1995 and 2004, it increased exponentially, from 5000 MW to 50000 MW.

In 2005 there were installed 50 GW, with the forecast of installing 180 GW more until 2010.

In Europe, the installed capacity also increased exponentially between 1992 and 2004, the countries with the highest increases being Germany (16629 MW), Spain (8263 MW) and Denmark (3117 MW).

Conclusions

The conversion systems of unconventional energy into thermal and electric power are being in full development worldwide. Of these, the solar energy and the Aeolian energy are among the most used to obtained thermal energy (heat) and electric power.

Aeolian energy is, possibly, the most advantageous source of energy, at a price of 4 Eurocents/kWh. Out of this reason, it is estimated that by 2020, the production of Aeolian energy shall be of 400 GW, namely approximately 8% of the total installed capacity in the world.

Solar energy is also a long-range source, with high potential, both for producing thermal energy used as such in order to produce how water and heating, and for the production of electric power.

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Aspecte privind resursele energetice regenerabile

Rezumat

În lucrare se expun date privind posibilitățile de utilizare a unora din resursele energetice neconvenționale: energia solară, energia eoliana, energia mareelor, energia geotermică, energia apelor termale, energia deşeurilor rezultate din activitatea umană