

## SECTION 3

### MODERN DEVELOPMENTS OF ENGINEERING

#### SIMULATION OF SOLAR COLLECTOR OPERATION SPHERICAL SHAPE

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In today's energy crisis, the diversification of energy sources is of particular importance. In the Ukrainian energy market, where the percentage of traditional energy is particularly high, varieties of so-called alternative energy can become promising for development. In particular, solar energy, whose share in total energy production in Ukraine is about 1%, can develop towards the application of new devices for heat generation. In this vein, "three-dimensional" solar collectors have recently become widely known. Their peculiarity lies in the fact that to increase the efficiency of the device during sunny days, the light-absorbing surface is not made flat but is slightly modified by the specifications of the device. Examples include such patented devices as spherical, hemispherical, and conical solar collectors [1, 2]. Inventors declared the high efficiency of these new types of collectors, but, unfortunately, there is no detailed description of the thermophysical processes taking place in them. The aim of this work is a numerical study of heat and mass transfer processes to identify the most efficient device and optimal conditions for its operation.

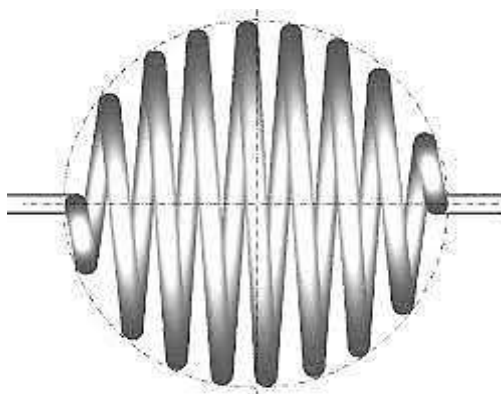


Fig.1 Schematic diagram of a spherical solar collector

Since the proposed design is new (Fig. 1, 2), its research was carried out by numerous methods using standard computational finite-element software codes. The work analyzes the movement of the working medium (water) through the spherical and flat solar collectors, the design of which does not provide the use of

additional devices to intensify the movement of the working medium. By solving a series of coupled problems of heat and mass exchange, the temperature, pressure, and velocity fields of the working medium in the manifold are determined. Based on a comparison of the results, the optimal angle of inclination of the spherical collector for the region of Kharkiv region was determined.

The results of the work are promising for use in small-scale energy or housing and communal sectors.

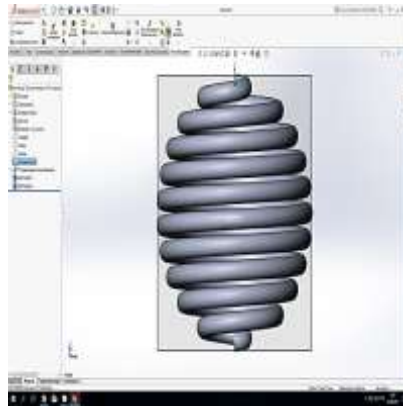


Fig. 2 Spherical solar collector simulated through the program

#### References:

1. Matsevitiy Y. To the construction of a spherical solar collector / Y. Matsevitiy, A. Tsentsiper, N. Safonov, S. Lushpenko. // Problems of Mechanical Engineering. - 2011. - 14, № 2. - C. 46 - 51.

2. Matsevitiy Y. Toward a spiral screw tube solar collector / Y. Matsevitiy, A. Tsentsiper, N. Safonov, S. Lushpenko. // Problems of Mechanical Engineering. – 2011. – 14, № 5. – C. 31 – 37.

## MODERN ENGINEERING DEVELOPMENTS AND THEIR BENEFITS

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Modern technology is constantly evolving, so it is very diverse and broad in its application. Here are some of the latest developments in technology:

- *Robotics:* Robotics is becoming more and more common in various industries. It is used to automate production, medicine, and other industries. Robots can be used both to perform monotonous work and to perform complex tasks requiring high precision.