Development of the method and calculation of the heat transfer coefficient of the soil

Rysbaiuly B.[1,a], Akishev T.[2], Mukhametkaliyeva N.[1,b]

[1] *International Information Technology University, Kazakhstan*
[2] *Engineering and Technical University of Ekibastuz, Kazakhstan*
[a] *b.rysbaiuly@mail.ru,* [b] *mukhametkaliyeva.nazerke@gmail.com*

Abstract: In this work an approximate method for determining the coefficients of heat transfer of soil is developed. The limitation of approximate value of the heat transfer coefficient and the monotony of the functional are proved. Algorithms for calculating the heat transfer coefficients of soil are developed and software product is designed. Using the measured data the heat transfer coefficient of rock is determined in the different areas of the open mine Ekibastuzsky. Nowadays one of the most relevant problems is to search and elaborate energy saving actions on creation of heat and technological processes with minimum thermal losses. Prior knowledge of thermo physical characteristics of the used and developed structural, heat insulating and lining materials has a huge impact. Thermal characteristics of enclosing constructions significantly influence the thermal and air conditions of the building and the work of heating system. Problems of energy saving and decrease in heat losses significantly influences an ecological situation, technical and economic indicators and capital expenditures of structural objects. In order to solve these problems it is necessary to know thermal capacity, heat transfer, heat conductivity and heat diffusivity of materials. Some materials have passport data, but others do not. Besides actual characteristics of structural materials can change during the operation and do not to correspond to their certificate or the passport. Therefore during the construction of objects of different function it is necessary to be able to define thermal characteristics of materials.

A very effective characteristic of the heat exchange process is the heat transfer coefficient h, between the air flow and the surface of soil. A lot of researches reveals the effect on the given dependence of the porosity of the material, the size of a form of the grains, and the effect of all possible physical characteristics of the material (for example, heat capacity, thermal conductivity). There is a huge amount of empirical formulas. But both the data and the formulas that form the basis for them differ sharply at various authors. There are a lot of reasons of a divergence: the influence of the internal resistance of the pieces; Complex geometric structure of the layer, which changes from various factors; the porosity of the layer, and the roughness of the grains. The value of the heat transfer coefficient is strongly dependent on the amount, thickness

and thermophysical characteristics of soil layers. In the depth of the cut, values of the heat transfer coefficient decreases. The coefficient has a significant difference at wind speed.

References

[1] Chudnovsky A.F. Thermophysics of Soil.1976. M. Nauka p.352.
[2] John H.Lienhard, Heat Transfer Textbook, Third Edition, Cambridge, 2008, p.672.
[3] Rysbai I B,. Akishev TB Convergence of the iterative method for determining the heat transfer coefficient. Proceedings of the sixth meeting of the Russian-Kazakhstan Working Group on Computing and Information Technologies. KazNU (16-19 March 2009) p. 273-276