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DEVELOPMENT OF A REMOTE MONITORING SYSTEM ON THE BASE JSC «ENERGOORTALYK-3»

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Formulation of the problem. Today, one of the important and key problems in the ecology and environmental protection field is the issue of increase in electromagnetic pollution generated by the main infrastructure networks of the city (high-voltage and ultrahigh-voltage electric transmission lines, telecommunication networks). This, in its turn, is due to population growth, urbanization of the main areas in the city and modernization of main infrastructure networks. All these aggravating processes lead to an increase in the intensity of the electromagnetic field distribution; and in this case, the high and ultra-high voltage electric transmission line holds a prominent place as a key electromagnetic pollution propagation object. According to the static data of international organizations, according to epidemiological studies, it was found that the electromagnetic radiation of high voltage electric transmission lines has a negative effect on human life, on the animal and plant world and on the ecosystem as a whole [1,2].

Objective. The agglomeration environment of the Republic of Kazakhstan, Shymkent City, namely the Northern, North-Central and West-Central parts of Shymkent City were taken as the object under study in the article. High-voltage and extra-highvoltage electric transmission lines were installed in these districts originating from the following power units - Substation - 220/110/10 “Yuzhnaya”, “Shymkent”, Substation - 110/10 kV “No. 6 Central”, “Nursat”, “Astana – 1”, “Astana – 2”. These territories have an average and critical danger of origin under the criterion of the electromagnetic pollution danger.

Materials and methods. The survey was conducted to evaluate the negative consequences of the electric field radiation intensity in high and ultra-high voltage electric transmission lines. The method of ground-based remote laser scanning was

applied using a laser range finder to survey high voltage electric transmission lines. The necessary geometric parameters of the 110 and 220 kV overhead lines were obtained during the electric transmission lines survey, i.e. the distance between the terminal wires; height of suspensions on a power tower; dimensions of high voltage electric transmission lines; horizontal distance from electric transmission lines to the point of interest. It should be noted here that several low-frequency energy facilities were taken to be comparatively analyzed and to obtain reliable indicative characteristics when the environmental monitoring was conducted. When the geometric parameters of high voltage electric transmission lines were determined by the method of mirror image, the electric and magnetic field strengths were calculated, and their characteristics were determined.

Results. The characteristic distribution areas of electric and magnetic fields in high voltage electric transmission lines were determined using the mirror image method with the help of PTC MathCad 15.01 Software Product, thus, dangerous and safe areas of electromagnetic radiation propagation were clearly described. The characteristics are given in the following graph 1.

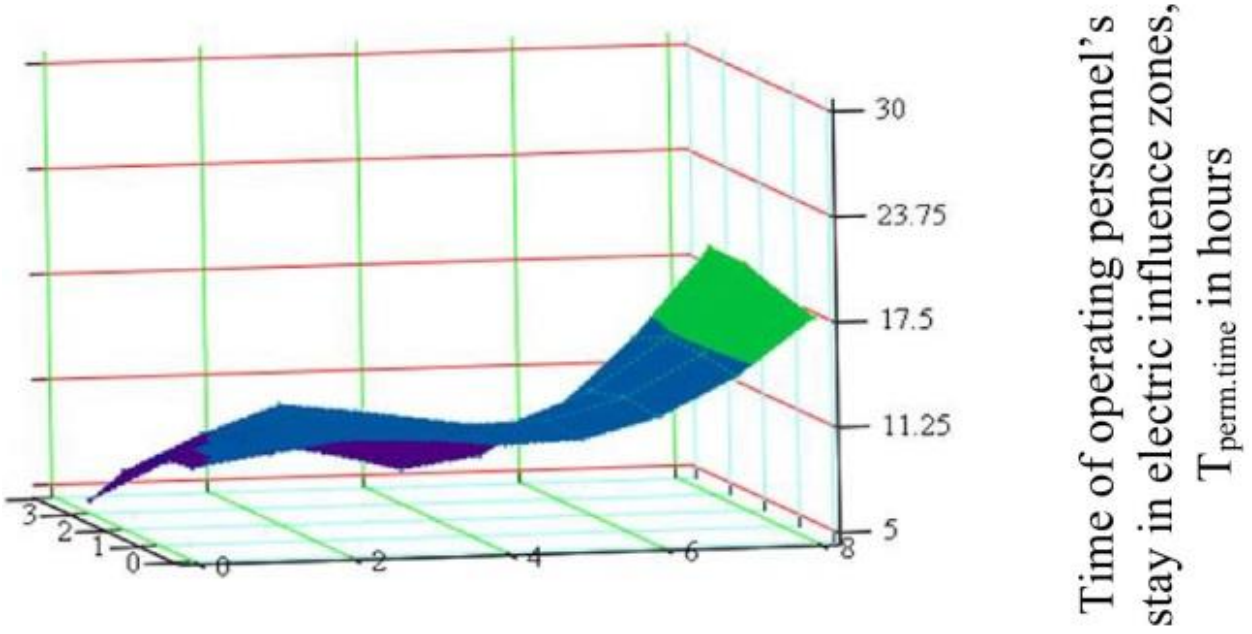

Fig. 1. Graphs describing the danger of electrical radiation

Conclusions. The levels of electric and magnetic fields in high voltage electric transmission lines were determined using the PTC MathCad 15. 01. The calculations showed that SCIENTIFIC COLLECTION «INTERCONF» | № 53 565 the average electric field strength in the districts was 5 kV/m, the maximum intensity was 8 kV/m. Accordingly the data exceeded the maximum permissible level (the operating personnel's maximum permissible level is 5 kV/m, for residents of residential buildings - 1 kV/m). The hazardous areas of electromagnetic radiation were identified withвthe help of a comparative analysis. Experimental calculations showed that the dangerous zones of electric field strength in the 110 kV overhead line were within 20 m for residents of residential buildings, and in the 220 kV overhead line - within 25-30 m for residents of residential buildings, and within 15-20 m for operating personnel, respectively. Dangerous areas of the magnetic field strength in the 110 kV HVETL were 20–25 m for residents of residential buildings, in the 220 kV HVETL - 40–45 m for residents of residential buildings, 20–25 m for operating personnel, respectively. The working personnel's permissible time and permissible biological time of stay in dangerous distribution areas were determined taking into account the level of electric field intensity.

References:

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[2] N.S. Faiz., M.I. Satayev., A.A. Berdalieva., A.M. Azimov, «Assessment of the level of electromagnetic pollution generated by a high voltage electric transmission line using the example of the Northern and North-Central parts of Shymkent City», Vestnik of Almaty University of Power Engineering and Telecommunications (AUPET), № 4(47) 2019, P. 220-229.