POLITECHNIKA ŚLĄSKA

WYDZIAŁ GÓRNICTWA, INŻYNIERII BEZPIECZEŃSTWA
I AUTOMATYKI PRZEMYSŁOWEJ

Dyscyplina: Inżynieria Środowiska, Górnictwo i Energetyka

Rozprawa doktorska

Opis parametrów drgań gruntu wywołanych wstrząsami górotworu uwzględniający kierunkowość tłumienia fal sejsmicznych

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ABSTRACT

In terms of Polish hard coal mines located in Upper Silesia, both to the underground mining operation and to the entire surface mining area, one of the main hazards is the seismic hazard, which intensifies with increasing depth of excavation. The tremors with different seismic energy accompanying the excavation are the cause of unfavourable phenomena, which result in the formation of a seismic wave, often reaching the surface and causing ground vibrations. Due to the possibility of serious damages to the surface infrastructure facilities, the vibrations transmitted to the surface are a real hazard, especially in urbanized areas.

The observations, which have been carried out for many years, make it possible to better understand the phenomena occurring in the rock mass, including the uneven distribution of vibrations on the surface after the occurrence of a high-energy seismic tremor. Frequently at measuring stations located closer to the epicentre of the tremor are recorded smaller maximum amplitudes of vibrations than at points located at a greater distance. One of the main reasons for the uneven distribution of the recorded values of maximum acceleration (velocity) amplitudes of ground vibration is the different value of the vibration amplification factor.

However, it is not always possible to justify this phenomenon solely on the basis of the properties of loose Quaternary formations. Due to that, in the paper it was assumed and shown that there is a relationship between the distribution of the maximum accelerations (velocities) amplitudes of ground vibrations generated by rock tremors and the direction of tectonic disturbances in the mining area of the mine.

The research area consisted of ground vibration data caused by recorded in the years 2009-2019 high energy tremors from two mines in the Upper Silesia Coal Basin. The analysis was performed using data mining methods. The models used were based on the regression analysis method and artificial neural networks. The conducted research made it possible to prove that there is a relationship between the directionality of the seismic wave propagation and the occurring tectonic disturbances. The created models can be successfully used to determine the distribution of ground vibration parameters in the event of new tremors occurring.