

Network system of seismic monitoring NSSM

Designation of NSSM system

The network system of seismic monitoring NSSM (NSSM system) manufactured by Elgeo LLP is intended for the organization of monitoring of seismic activity for the regional forecast of a shock hazard of sites of the massifs of rocks and ores.

The NSSM system is the technical tool used at realization of actions of protection against the emergency situations bound to development of mineral deposits.

In Kazakhstan the systems of seismic monitoring are already used on some fields. Use of systems of seismic monitoring on all fields of ore minerals where production is made in underground excavations is perspective.

Economic effect of use of system of seismic monitoring consists in decrease or prevention of damage from emergency situations, the bound to a collapse of underground excavations. The well-timed forecast allows to bring personnel and an expensive inventory out of a dangerous zone in advance, to execute other protective measures and, thus, to prevent costs of restitution of an inventory, payment of compensations by the victim which can be the considerable.

The range of application of the NSSM system is not limited only shock hazard fields of solid minerals. The NSSM system can be applied to monitoring of harbingers of emergency situations everywhere where as a harbinger of emergency situation serve the physical phenomena causing emergence of seismic waves, for example accidents on oil fields, the bound to formation of underground emptiness at oil recovery, accident on oil pipelines and others.

Principle of work of the NSSM system

The forecast of shock hazard of sites of the massifs of rocks and ores is based on the common regularity of development of geomechanical processes according to which infrequent important events (a collapse of large volumes of the massif) are prepared by a large number of more shallow events (emergence micro and macro cracks, breaks). Therefore to predict emergence of large-scale destructions, it is necessary to monitor constantly accumulation of shallow damages of the massifs of rocks. One of ways of such tracking is filing of seismic events - the geodynamic phenomena which are characterized by emergence in the massifs of rocks or ores of the seismic waves arising at formation of damages of the massifs of rocks with the subsequent calculation of geographical coordinates of their epicenters and assessment of their seismic energy by means of systems of seismic monitoring.

The network system of seismic monitoring NSSM consists of network of the seismic field units connected in uniform system which allows revealing within the mine field of a zone, dangerous on mountain blows, on the basis of the continuous filing of parameters of seismic activity. The NSSM system in 2014 is installed on the field at the customer. The map of placement of 20 field units is given in fig. 1.

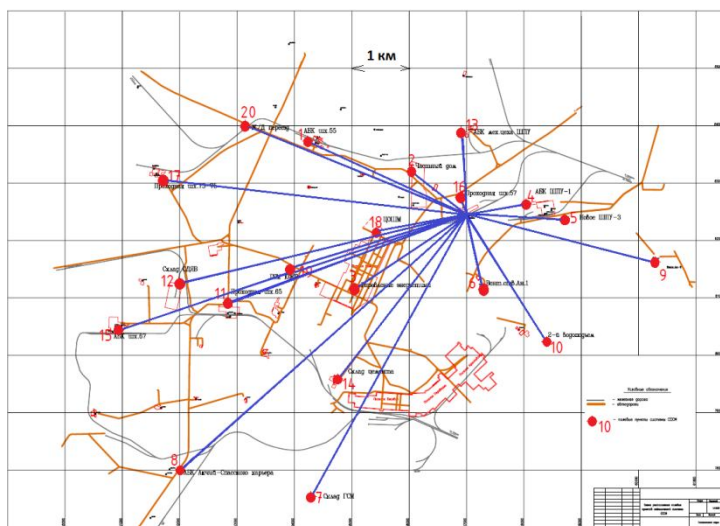


Fig. 1. The map of placement of field units of the NSSM system on the field

The seismic signals received by geophones continuously are analyzed in the automatic mode. At identification by means of an express algorithm of signals of a seismic event, the fragment of the data entering from geophones registers in the file of a seismic event which comes to the center of collecting and processing to the operator of system. The operator makes in the interactive mode by means of the express computer program processing of the file of an event. Processing's are result geographical coordinates of epicenter and an energy class (seismic energy) of a seismic event. In process of accumulation of data array about seismic events there is possible a forecast of emergency situations. According to some scientific publications, such forecast is possible

in 30-60 days prior to a collapse.

The example of filing of a seismic event is shown in fig. 2. Display of epicenters of seismic events on the plan of mining operations is shown in fig. 3.

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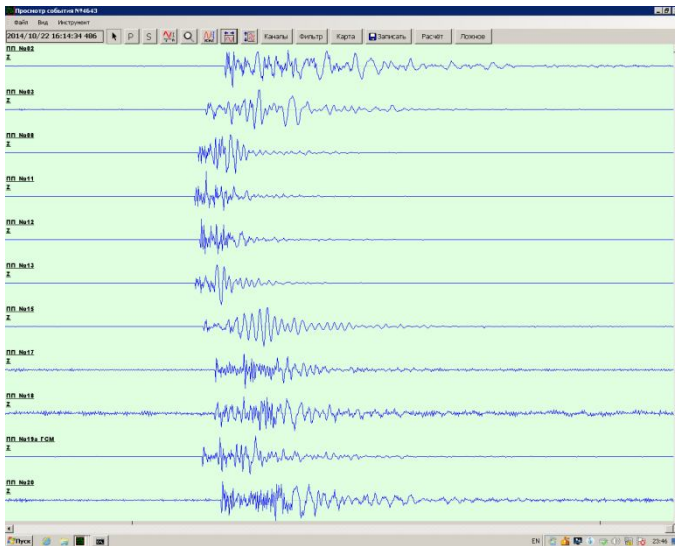


Fig. 2. Example of filing of a seismic event NSSM system

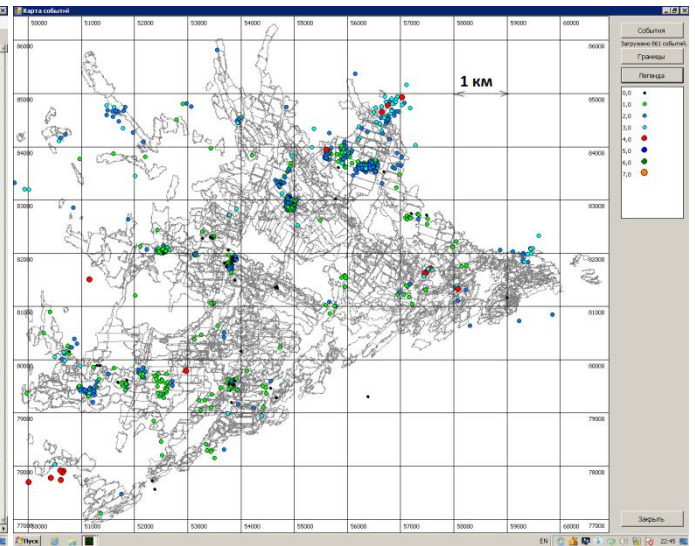


Fig. 3. Display of the seismic events registered by the NSSM system on the plan of mining operations

The design of field unit of the NSSM system allows placing it both on a surface, and in underground excavations, explosion-proof on gas and dust. Geophones for the NSSM system are shown in fig. 4 and fig. 5. The design of seismic field unit for land installation is shown in fig. 6. The design of seismic field unit for underground installation is shown in fig. 7. Any modern means of communication compatible to technologies of computer networks can be used to communication of field units with the center of collecting and processing. Wireless computer networks are convenient for the field units established on the Earth's surface. In fig. 8. the access point of the center of a wireless communication network is shown. Client stations of wireless network for communication with the center of collecting and processing are shown in fig. 9. and fig. 10. For communication with the field units established underground in mines, the dedicated wire lines, optical lines have to be applied. At development of the system of NSSM the problem of synchronization of all field units of system including established in underground excavations from GLONASS/GPS of the receiver installed on the land surface is solved.



Fig. 4. NSSM geophone for the surface installation



Fig. 5. A geophone for well installation



Fig. 6. Field unit of the NSSM system for land installation



Fig. 7. Field unit of the NSSM system for underground installation



Fig. 8. Access point of the center of a wireless communication network of NSSM



Fig. 9. The client station of a communication network of NSSM for average distances



Fig. 10. The client station of a communication network of NSSM for long distances