Study of ground water flow structure as a factor of geological risk reduction in water lowering protection measures – a case study of the Angren coal basin

Tursunmetov R.A., Rahmatillayev H.I. & T.K.Hodjayev

Tashkent State Technical University, Institute of hydrogeology end engineering geology "HYDROENGIO", Khodjibaev str.64, Tashkent 700041, Uzbekistan, e-mail: hydrouz@rambler.ru

Abstract

Study of groundwater flow structure is very important for coal mining in order to define the water bearing zones for protection measures on water table lowering. It is worth to note that complex hydrogeological investigations connected with the study of groundwater flow structure require the investigation of ground permeability changes and groundwater flow direction. From this viewpoint the inclusion of the electromagnetic investigations can substantially improve the effectiveness of the complex study in terms of flow intensity and direction for optimal position of vertical drains in zones of the highest permeability. For this purpose in Hydroengio institute the method of hydrodynamic geoelectrics (Tursunmetov, 2001, 2002) has been developed. The method based on the resistance non-linear parameter study, which behaviour determines the flow intensity.

The proposed methodology has been tested in the Angren coal basin located in the Angren river valley. Coal is mined here in open quarry in two layers crossing quarry right slope. The mine depth is 200-250 m. As a mining result the natural groundwater balance and the slope equilibrium have been destroyed. Coal layers were water logged and clayey layer was deformed.

The complex study was carried out with a view to lower the water table. The principal task was to ascertain how to position the vertical wells (drains) in the most highly permeable zones. The results showed that groundwater is contained in upper-quaternary gravel-pebble sediments located in creeks. They are connected with tectonic disruptions along the slope. The non-linear parameter study demonstrated that there are two directions of the groundwater movement: along tectonic disruptions and along creeks. The landslide processes are developing over these zones because of the shear deformation in Paleogene clay due to water overflow from Neogene sediments through the tension fissures.

If tectonic disruptions played a recharging role in the natural groundwater balance, the promoted fissures were created in above layers. Besides, tectonic disruptions crossing above described disruptions were found, which serve a border of highly permeable zones. It is worth to note that the results of the water abstraction from vertical wells, which were located in accordance with results of the study, showed the high specific yield reducing risk factor in water lowering protection measures.

Abstract