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Permeability of the Coal and Rock Mass with an Artificial Cavity

Effect of underworking on the rock mass is manifested more than in the presence of hydraulic fracturing cavities. Currently applied methods and tools for identifying are the cores properties even in conditions "close to bedded" ignoring these features. As a rule permeability assessment is made on the basis of functional dependencies $k=f(\sigma)$, which connect gas permeability coefficient k with unspecified load proportional to the depth of development.

Parameters of such destruction with sufficient accuracy for practical purposes can be set on the basis of host rock samples testing in the given loads when the relationship between stress σ and strain ε terminates at a point which corresponds to the ultimate strength Rpr of the material on uniaxial compression.

Design schemes based on geotechnical models developed and validated at the National Mining University allow quantifying the stress distribution in the rock mass as a result of its underworking. In this case, the models size of the zone of elastic deformation of the studied part of the mass in relation to the inelastic part can be selected so as to be able to draw an analogy between this area and the loading device of kinematic type that performs loading under constant strain.

It is necessary to consider the rock mass destruction features in the process of underworking. In moving the coal seam face beyond the fixed space the close rocks first, and then the main roof are caved, forming the so-called zone of high permeability. Model study can reasonably transfer the results of the laboratory tests on real rock mass. As a result of the models investigation it is possible to quantify the permeability of the coal and rock mass by replacing three dimensional stress with equivalent uniaxial stress at each point of the rock mass σ_{ekv} with subsequent applying of this stress along the experimentally determined values of permeability.

As the result of theoretical calculations were obtained approximate scheme for calculating permeability of underworking mass based on regularity of rock failure for ultimate strength and algorithm to determine the spatial location of the "slow" gas. It allows easily identify anomalous zones in underworking mass characterizing it as a collector of gas. A spatial location of the collector shell is also determined. The area delineated by shell collector, except the high gas permeability zone, is in its turn, a potential source of "slow" gas.

References:

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