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Estimate of Dust Load Considering Personal Respiratory Protection

For definition of quantity of the dust getting into the lungs of a person in a definite time it is necessary to know concentration of dust C within air of a working zone, the variable volume of pulmonary ventilation Q , duration of a shift t , and quantity of shifts N :

$$D = 0,001kCQtN \quad (1)$$

Where D – dust load, k - the coefficient considering existence of a respirator.

Apparently from the expression (1), it is necessary to consider respirator existence that considerably reduces quantity of a dust which gets to lungs. Value of coefficient is $k = 0.1$ if personal respiratory protection (next PRP) is really used, if isn't present than $k = 1$. However, each type of respirator has its quality, which depend on the design of respirator, and the filtering properties of the material. Besides, at the coal enterprises various types of respirators and also various types of filters are used. However, it is inexpedient to use same value of coefficient. So, while calculating dust loadings it is necessary to consider efficiency of certain protective equipment of respiratory organs as they considerably reduce risk of diseases pneumoconiosis and dust bronchitis.

All PRP's are characterized by two main indicators: resistance to breath and penetration coefficient. The latter shows efficiency of a respirator and depends on design of a half mask and properties of a filtering material of which it is made. Experimentally PRP's penetration ratio was identified, which expresses the mass stake particles which penetrated through the protective agent (K_n)

$$K_n = N_0 / N \quad (2)$$

Where N_0 - concentration of dispersed particles after respirator mg/m^3 ; N - concentration of disperse particles to a respirator, mg/m^3

For experiment we used some popular models of PRP such as ШБ-1, ППА-ТД-1 and ППА-ТД-2.

This work covers only a small part of the problem, which is related to the assessment of the effects of the usage of respirators and dust load definition. To determine a high degree of accuracy the impact of certain types of respirators to reduce the risk of disease should continue the research in this direction. But one thing is certain that the usage of all investigated types of respirators significantly reduces the risk of pneumoconiosis.