UNSUPPORTED GAP OF A ROOF IN A COALFACE

Beysembayev K.M., Malybayev N.S.
The Karaganda State Technical University, Karaganda,
e-mail: kakim08@mail.ru

To reveal an unsupported roof gap effect on the face operation efficiency and establish its forming peculiarities relating to powered complexes of ОКП, КМ-144, КМ-130, Glinik types used in the Karaganda basin, we carried out observations of the faces in the conditions of Kostenko, Kirovskaya mines on the seams with the inclination angle 6-16º and depth up to 540 m. The studies permitted to establish the real values of the unsupported roof spans, which is necessary for calculating the roof stability; there were also confirmed the suppositions about contacting growth to the crossbar end. The complexes operation analysis shows that the main reasons causing the deflection of the roof unsupported strip width from the designed one are (Figure 1) the conveyer non-motion to the face *δнкв.*, the cutter-loader angle shift to the face due to its center of gravity to the seam; δα =K*m, where K is proportionality factor, m is the seam mined thickness. The gap increase is caused by changing the run of the support section motion, when the allowable angle of interlocking ties turn is exhausted (δнкп = n*δкэ). δкэ is here the decrease of motion run, and n shows that it increases from cycle to cycle and growth with the face progress (n=1, 2, 3....). Besides, the section overhead cover inclination causes the crossbar shifting to the blockage, including the units having a four-terminal networks formed by the covers and the bases beyond their operation limits. The unsupported roof strip increases for the width b for the soil-terrace notch, i.e. there is a gap δт, depending on the operation technology. For a straightforward face *δm = 0*. It's necessary to take into consideration the gap determined by the width of coal extraction, δo with the crossing breakage, as well as the gap δвв, depending on the peculiarities of crossbars interaction with the roof and being a random value which can be from 0 till L, where L is the crossbar length from the face end till the line of the resistance resultant. In the expressions given below there is included tha gap caused by other reasons:

$$\delta_{нк} = n^* \delta_{кэ} + K^*m + (\frac{lo}{2} + lk)(1-\cos\beta) + \delta m + \delta_{вв} + \delta_{кк} + \delta o + \delta n, \qquad (1)$$

where *lo, lk* are respectively the distance between the hydro-props axes and the length of the console crossbar;

β is the inclination angle of the top overhead cover relative to the layers;

$\pm \delta_{усс}$ depends on the concrete support structure, particularly, $\delta c = 0$;

δo is an additional gap as a result of the seam extraction taken on the base of the experimental data or the mentioned methods where there is calculated the pressure on the layer with sections of different phase states, whose parameters are determined based on the experimental coal and rock breaking, by the data of nature observations and other studies and combined into a matrix of the layer state. With certain loads and limit states of the near-face sections the later are considered broken then:

$$\delta o = \sum_{1}^{k} \delta x_k , \qquad (2)$$

where δx_k, k are the width and the number of the sections broken.

If we start from the condition that the additional motion of the sections is carried out with the gap increase for a cycle (without accounting the gaps having a constant character in these conditions), such a necessity occurs in $n = bk / \delta k$. The parameter ***δнк*** takes into account the culture of servicing and its experience (members ***δвв;*** *nδкэ; δн;* ***δo***). The laws of the support delay growth, revealed by the studies, were taken into consideration mainly
at the level of common engineering knowledge and on the experience of servicing, i.e. without a system. The support delay occurred due to these reasons almost in all the faces, but they were at the starting stage of using new equipment (М-130,УКП, Pioma) significantly less than in the old ones , as control was carried out by the designers. At the same time the analysis shows that there is

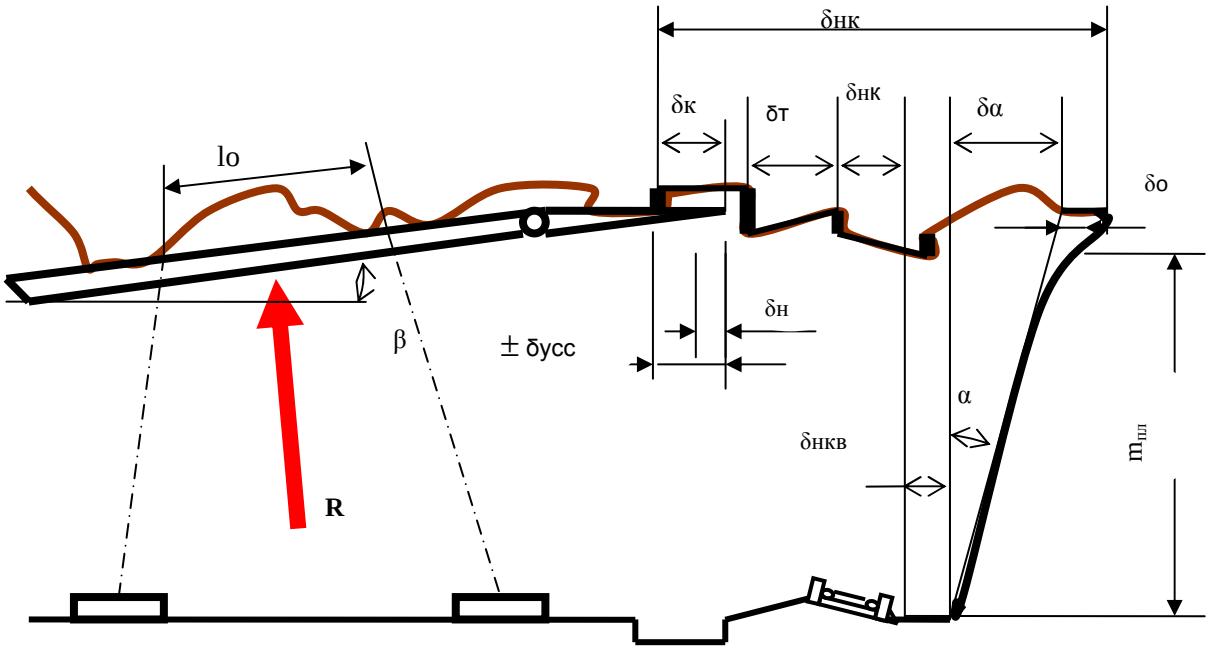

Figure 1 – To calculating the span of unsupported roof (there is not presented the accumulated gap when moving sections δнкп, δвв can be accounted through δо)

equipment when the service culture depends in a less extent, and supports and other equipment are protected from unauthorized random actions. If in the roof there are zones of predominating contacts, in a number of cases console crossbars rested against the pitches made by the cutter-loader auger and didn't practically contact with the roof at the section whose length was up to 30 % of the whole face length, at the exposure width 1,2-1 m, where there began intensive inrush forming.
By results of researches the calculation program is created [1]

References

1. Beysembayev K.M., Zhakenov S.A., Zhetesov S.S., Demechshuk E.N., Shmanov M.N., Tir E.D., Malybayev N.S. To the New Machine – Technological Systems and Their Models Development. – M.: The Coal, 2011. – № 4. – P. 69–71.