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Prevention of firedamp explosions

There is no practical measure which can arrest the firedamp explosion in coal mines. The only thing that can be done is to take preventive measures. Theses measures can be divided into the following three groups:

1. *Measures against accumulation of dangerous firedamp mixtures in mine workings from the beginning*
2. *Measures against ignition of flammable firedamp mixtures*
3. *Control of firedamp emission*

Measures against accumulation of dangerous firedamp mixtures in mine workings from the beginning

The most effective method of preventing firedamp explosions in mines is by providing adequate ventilation which will dilute the firedamp, besides other harmful gases. Frequent sampling of mine air for methane at several points in the mine is to be carried out.

The following measures can be taken under this category:

(i)The mine should be mechanically ventilated by the exhaust ventilation method. If in a mine methane emission is greater than 5 m^3/tonne of daily output, an additional or reserve main fan should be provided with an independent drive and power circuit.

(ii)The mine equivalent orifice should be as large as possible (>2m^2).

(iii)The ventilation of mine workings greater than 3 m in length should not be done by diffusion alone.

(iv) The ventilation of development headings should be done by utilizing the mine ventilation pressure as far as practicable. If auxiliary fans are required to be properly used, installed, maintained and located so that air is delivered within 5 m of the face and recirculation of ventilating air is eliminated to keep the working face clear of flammable and noxious gases.

(v) Ventilation door should be correctly located and kept closed except when men, equipment and tubs are passing through then. As far as possible they should be self-closing type.

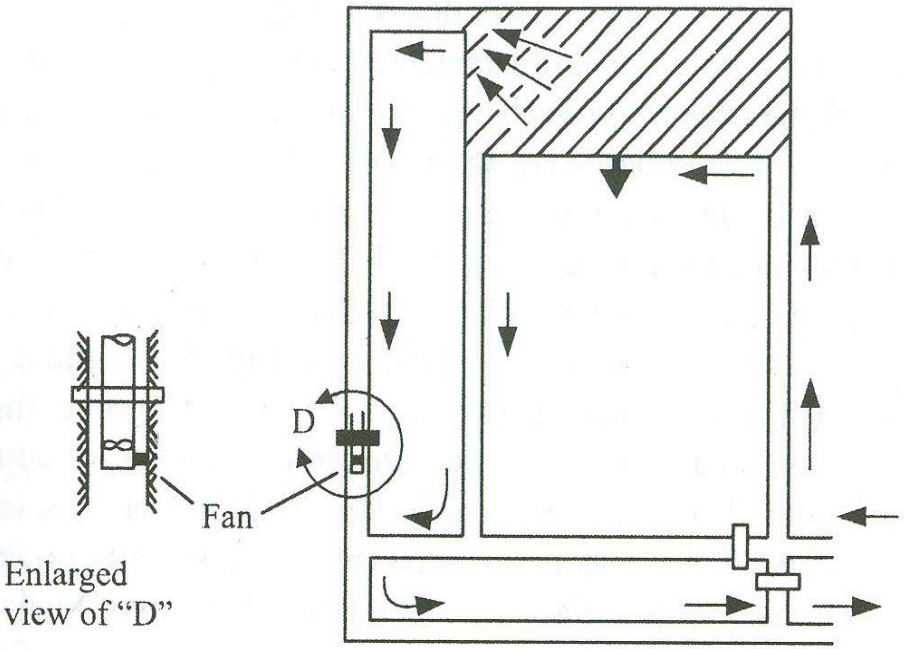
(vi) The mine ventilation system should be planned so that simple, effective and reliable ventilation of all workings is assured. Where multiple main fans are used, the ventilation system should be so arranged that no adverse air reversal will occur in the failure or stoppage of any fan.

(vii) Seams should be extracted, as a rule, from top downwards to decrease the methane levels in the lower seams.

(viii) The method of extraction should be selected so that it guarantees an easy and safe ventilation of the faces by air dilution with adequate velocities at the waste edge.

(ix) A particularly high standard of unit ventilation by separate ventilation splits should be maintained in each mechanized mining section and in districts/panels liable to gas outbursts.

(x) In B&P and longwall retreating panels in very gassy seams worked with caving, the firedamp content in the goaves behind the active faces must be controlled by in-mine local or central drainage of goaves or drainage through surface ventilation boreholes. Bleeder systems with bleeder entries and bleeder entry connections can be successfully employed to move firedamp-air mixtures continuously from the caved areas behind the retreating longwall faces away to the return a



Bleeder system of ventilaltion of a retreating longwall face.

(xi) Mining with backfilling or solid stowing of the waste/goaf, especially hydraulic filling, prevents formation of methane reservoirs in goaves.

(xii)Horizontal methane drainage holes drilled into a seam in advance of a panel must be sealed before they are intercepted during extraction of the panel to prevent methane from being discharged forming flammable firedamp-air mixture.

(xiii) Air currents and methane emission should be checked by systematic measurement of air quantities and their methane concentration.

Special examinations for firedamp layering should be made during periods of falling barometric pressure in ascensionally -ventilated roadways adjacent to old workings, within the areas of moving ground behind faces, and high points at which gas will tend to accumulate.

For judging the possibility of formation of methane layering, the Middendroff formula may be used to calculate the 'layering index':

$$S_{Index} = (24v^2/cF^{1/2})^{1/3}$$

Where v is the mean velocity (m/s)

c is the mean methane content of air current (%)

F is the area of the cross-section of the airway at the measuring station (m^2)

If $S_{Index} < 2$ there is probable danger of methane lyering

$S_{index} > 2$ there is no danger of methane layering.