

## HYDRAULIC CIRCUITS OF DRAINAGE CONSTRUCTIONS OF MINE VENTILATING SHAFTS

Atroshenco D.A., the student  
 Ignatov A.V., candidate technical sciences  
 Donetsk national technical university

Terms of commissioning constructions mine ventilating shafts essentially depend on time of their drainage, there fore the problem of definition of optimum technological their circuits drainages is actual.

Until recently the significant part of drilling ventilating shafts was drained with the help tub (the capacities made of a steel pipe in diameter of 0,9 m and length 5 ... 7 m), fixed on ropes chisel lift (fig. 1, a).

Time of one cycle pump out at use tub is defined by dependence

$$t_{\Pi} = \frac{H_B}{V_C} + \frac{H_B}{V_{\Pi}} + t_{BC}, \quad (1)$$

Where  $V_C$  - speed of release of a tub, km/s;  $V_{\Pi}$  - speed of rise, km/s;  $H_B$  - a water level in a trunk, m;  $t_{BC}$  - time necessary for filling and devastation of a tub.

Volumetric speed pump out thus is equal

$$Q_{OTK} = \frac{q}{t_{\Pi}} = \frac{q}{H_B \left( \frac{1}{V_C} + \frac{1}{V_{\Pi}} \right) + t_{BC}}, \quad (2)$$

Where  $q$  - capacity tub  $m^3$ .

Having based on the equation (1) and (2), it is possible to receive dependence for definition of time of drainage of a shafts. The decision of such mathematical model has allowed to determine time pump out a shaft depending on its depth and water-inflow.

So, at pump out from the average shaft in diameter of 2,6 m ( $S=5,3 m^2$ ) of tub in capacity  $4,0 m^3$  which goes on a trunk downwards with speed  $V_C = 6,8$  km/s and upwards  $V_{\Pi} = 1,76$  km/s, and also are filled and devastation for  $t_{BC}=60$  with at water-inflow  $Q_{\Pi P}$  of  $=30 m^3/p$  effective work on drainage up to depth  $H=570$  m is possible, and at increase in water-inflow up to  $50 m^3/p$  depth pump out is reduced up to 300m. There fore practical use tub for drainage of shafts with water-inflow more than  $50 m^3/p$  is irrational.

Except for tubs, for pump out shafts probably application of pumps, airlifts and pump - airlift installations.

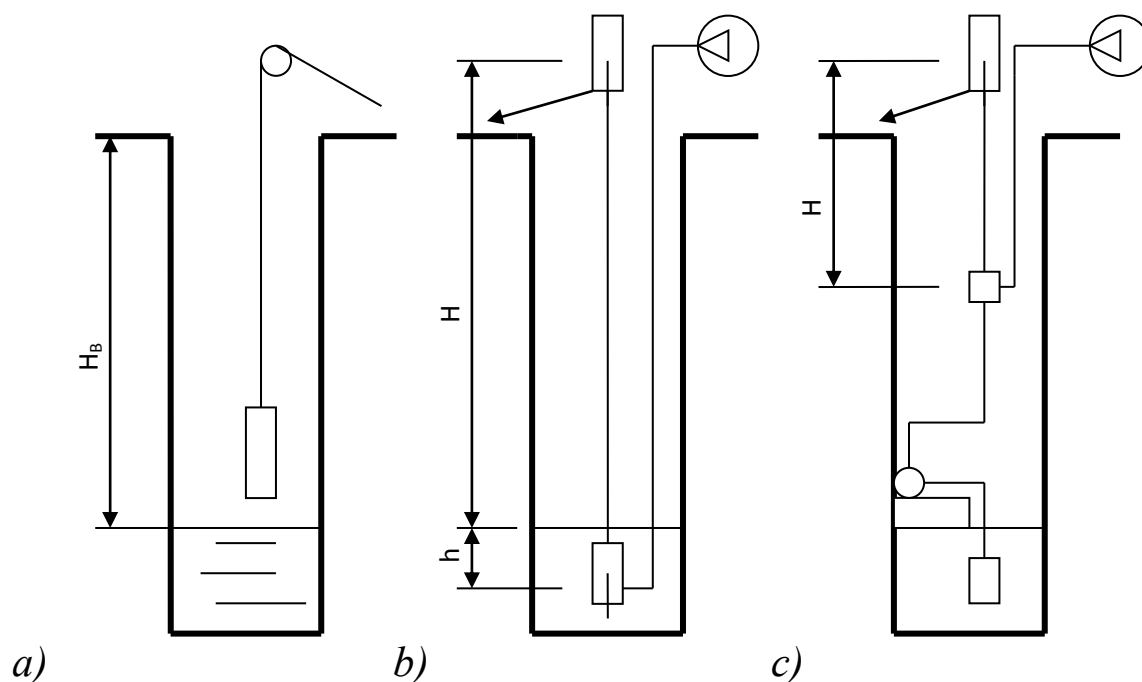


Figure 1 - Circuits of drainage of ventilating shafts:  
*a)* - with use tub; *b)* - эрлифтом; *c)* - pump -airlift installation

However application of pumps not always probably. So, frequently used for these purposes ship pump ЭЦВ 14-210-300К can provide pump out waters from a trunk with depth no more than 420 m.

Airlift installations with diameters of elevating pipes 0,1÷0,2 m, submission not less than 20 m<sup>3</sup> / б and efficiency over 10 % allow to transport water from shafts depth up to 400 m (fig. 1, *b*).

It is necessary to apply to shafts of the greater depth pump-airlift installations (fig. 1, *c*).

Application pump-airlift installations for pump out the ventilating shafts spent by drilling, provides reduction in time of drainage of a shaft in comparison with other technological circuits.

At the same time in the further researches at the analysis of technological circuits of drainage of shafts it is necessary to take into account also capital expenses and power inputs.