APPLYING OF AIRLIFT ON A LIME-BITUMEN SOLUTION FOR PIPELINE TRANSPORT

Ayanot D. A., student,
Ignatov A.V., candidate of technical sciences,
Donetsk National Technical University

The results of studies of application of on a lime-bitumen solution for pipeline transport are reviewed

At an electro impulse method of destruction of breeds the distance from a trunk of the destroyed breed is stipulated with the help airlift. Transportation liquid is the lime - bitumen solution of density equal ρ=1100 кг/m^3. Lime - bitumen solution after motionless period within several hours has very high viscosity. After shuffling the solution has viscosity, that corresponds to viscosity of a clay chisel solution.

It's developed the plant for realization of a trunk by depth up to 250 м by an electro impulse method. Thus the internal diameter of an elevating pipe of airlift makes 402 mm, minimal geometrical immersing of the mixer 13 м, height of rise of a liquid of 8 m.

In the initial period of drilling of a trunk immersing of the mixer h=13 m., height of rise H=8 m., length of the making pipeline of 8 m. At a final stage the depth of immersing of the amalgamator makes h = 100 m., height of rise H = 8 m., length of the making pipeline of 150 m. Density of a firm material $\rho_s = 2700 кг/м^3$.

At drilling a shaft by a diameter of 2,25 m. with speed 7 м/hour expected meanings of a volumetric consistence of a firm material in pulp for airlift with a diameter of an elevating pipe of 0,402m. can make 0,025…0,047.

In case of a vertical arrangement of a giving pipe the speed necessary for transportation of a piece of a firm material is determined under the formula:

$$V_S = \sqrt{\frac{4(\rho_s - \rho) g d_m}{3\rho c_x}},$$

Where g - acceleration of free fall, d_m= average diameter of a piece transportation of a firm material, c - coefficient of resistance.

The accounts show that m^3/hour for transportation of a piece of a firm material of density with ρ_s = 2700 kg/m^3 an average diameter d_m=0,125 *m*. The speed is necessary V_S=1,93 *m/sec*.

For maintenance of such speed the productivity airlift with an internal diameter of the making pipeline 0,402 м should make not less than 880 m^3/min. Thus the charge of compressed air will make up to 33 m^3/min.

For maintenance of steady work airlift his regime point should be more to the right of an optimum mode. Otherwise fluctuations of pressure in the amalgamator and productivity of airlift will have significant amplitudes and periods, that can result to damage of airlift. For given airlift modes with small meanings of amplitudes of fluctuations will be observed at the charge of compressed air not less than 46 $м^3/\min$.

Proceeding from these reasons and prospective increase of the specific charge of compressed air in 1,5 times follows, that the necessary charge of compressed air of airlift of a trial sample of electro-pulse installation makes 50 … 70.

Experimental installation.

For check of the basic prospective airlift parameters is skilled - industrial sample of electropulse installation above mentioned, the experimental researches of model of airlift. Airlift the experimental installation has an elevating pipe (1) with an internal diameter 191mm, soaking up pipeline (2) with an internal diameter of 158 mm having airline (3) with an internal diameter of 62 mm. As a source of pneumoenergy the compressor (4) such as 270 ERL of firm "BAUER" with nominal productivity 23 and superfluous pressure of a forcing 1,3 МПА was used. The dump of a mix transportation of a liquid and air was made from an elevating pipe (1) in capacity (5), executed from a pipe by a diameter 1000mm. In general length 9м and supplied in the top part by a rectangular cut for air. The elevating pipe together with airline is shipped in the step tank of the cylindrical form, the top part (6) which has a diameter 2000мм, and bottom part (7) -480мм. The dump of a liquid from capacity (5) was made through placed in her of the bottom part a branch pipe with a flexible sleeve (8) diameter 250mm in capacity (9) and further in the tank.

So, it is possible to make the following conclusions:

1. Owing to specific properties of a solution the volumetric submission of airlift makes 54 … 64 %.

2. The opportunity of transportation by airlift of a mix of a firm material with the maximal sizes of pieces of 100 mm with a lime-bitumen solution is experimentally confirmed. Thus the submission of airlift has made 125 … 142 $м^3/hour$, and charge of air - 8,3 … 9,5 $м^3/\min$.

3. For work of a sample with expected submission 800…960 m^3/hour it is necessary to supply submission in the amalgamator of airlift 53…77 m^3/min of compressed air.