УДК 622.4

Chernaya A., Khomenko E.

Features of Laying Underground Communications by Microtunneling Method

Belarusian National Technical University
Minsk, Belarus

Microtunnelling is one of the methods of trenchless laying of communications. The main feature of the technology is the high accuracy of penetration and the possibility of constant monitoring of its trajectory. Microtunnelling allows you to perform tasks for laying communications in the most difficult conditions [1].

The technological process of laying communications by microtunneling includes preparatory, auxiliary and main work. The main work includes several steps.

At the first stage, with the help of a high-precision sinking shield, a pilot tunnel of metal sections is laid. The shield is controlled by the control container, located near the launch pit. The rock is mixed with water, which is supplied by a soil pump to the bottom hole chamber.

At the second stage, the equipment of the shield expander is installed, which consists of four interconnected stabilization sections. Following the shield, a shield jacking station is installed, which ensures the movement of the pilot tunnel.

At the third stage, following the expander shield, sections of the tunnel are successively pressed into the ground. From the bottom of the trolleys along the stacked rail tracks the rock is shipped [2].

Removal of the developed rock is carried out by a hydrotransport system containing lines of rock transport, water supply to the bottom hole space, and a separation unit. In the

bottom hole, the rock mixes with the fluid flow. The resulting hydraulic mixture is transported through a transport line to a separation unit, where rock particles are separated from water. Purified water from the rock particles is fed back to the bottom hole through the feed line. All collector sinking is carried out under the control of operators who are in the control unit.

In this laying method, a bentonite suspension is used, which is a mixture of water, bentonite and various kinds of additives. Such a solution serves to structure formation, increase viscosity, decrease filtration, stabilize well walls, and improve lubricating properties.

Microtunneling technology allows pipelines to be laid in soils of any category – from unstable loams and aquifers to rocks. Depending on the category of soil, first of all, the corresponding cutting organ of the tunneling machine is selected. This allows to achieve optimal speeds and parameters of penetration. An equally important factor in the quality of penetration is the choice of a particular drilling fluid composition [3].

It should be noted that during the sinking of communications with a large cross-section of the channel, large volumes of rock are to be excavated from the bottom to the surface, and accordingly, the use of drilling mud is significant in volume.

Microtunneling uses expensive bentonite-based drilling fluids and drilling foam. From the point of view of toxicity the organic components of a brown solution with a low relative molecular weight, oil and oil products are considered to be dangerous [4]. The use of drilling fluids based on bentonite and various polymers are harmful to the environment. They are toxic long-acting products. Therefore, excavated soil must be transported outside the city at a distance of 20-30 km, followed by burial in spent sand and gravel pits using waterproofing measures.

Thus, the use of the above drilling fluids is economically costly and environmentally unsafe. Therefore, it is relevant to develop alternative types of environmentally friendly drilling fluids.

References:

1. Dubensky, M.S., Kargin A.A., Gilyazidinova N.V. Technologies for trenchless laying of communications / M.S. Dubensky , A.A. Kargin, N.V. Gilyazidinova. – Young Russia: II All-Russian, 55 scientific-practical conf. – Kemerovo, 2010. – P.397–399.

2. Rybakov, A.P. Fundamentals of trenchless technologies / A.P. Rybakov. – M.: Press Bureau № 1, 2005. – 304 p.

3. Kister, E.G. Chemical treatment of drilling fluids. / E.G. Kister. – M .: Nedra, 1972. – 392 p.

4. Kuzmina, R.I. Chemical reagents for drilling oil and gas wells / R.I. Kuzmina, S.V. Malyshev. – Saratov: SSU, 2008. – 27 p.