

Use of technologies based on soil reinforcement when trunk pipeline repair

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ABSTRACT: Methods of bottom bed sections protection in places of river crossing with underwater pipelines and other buried communications are given. The methods described are based on structures use which allow both to stop the erosion process and promote the restoration of the initial bottom topography. It is well known that the process of change of river bed relief is continuous. In this connection, an emergency situation occurs as a result of soil washing and evacuation at some sections of underwater pipelines under operation, which can provoke pipeline failure and ecologic disaster. That's why timely detection of sections where processes of bottom erosion are progressing in a zone of piping and the following restoration of bed topography is extremely actual.

1 USE OF ANTIEROSION COVER (AEC) IN A RIVER BED

One of the methods of bed washout protection as well as restoration of the washed out soil is a method based on use of antierosion rubber-cloth cover. The above cover was successfully used in bank slopes strengthening.

AEC is a rhomblike ribbed construction (Fig. 1) with a rib height 10-12 cm. Rhomb diagonals are chosen in dependence on water stream velocity. Material for AEC manufacturing is a strip of conveyor belt with almost indifferent floatability.

Thanks to increase of hydraulic friction in place of protective cover laying, loss of water flow energy

occurs which in its turn causes a process of deposition the alluviaions, being before in motion, in cells of AEC.

Protective cover (Fig. 2) consists of a set of closely laid separate elements (1) arranged along a pipeline axis (2) in such a way that they overlap the whole section (3) being subjected to washout. To fix the cover in a bed in a given position, the construction is equipped with anchor beams (4) which are not fixed stiffly to a bottom soil and can vertically deepen as a result of possible undermining.

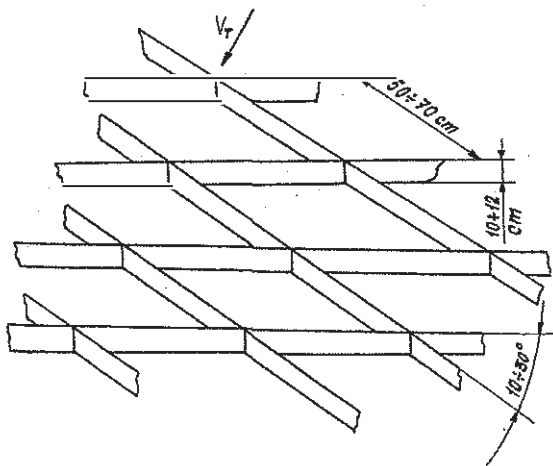


Figure 1. AEC construction.

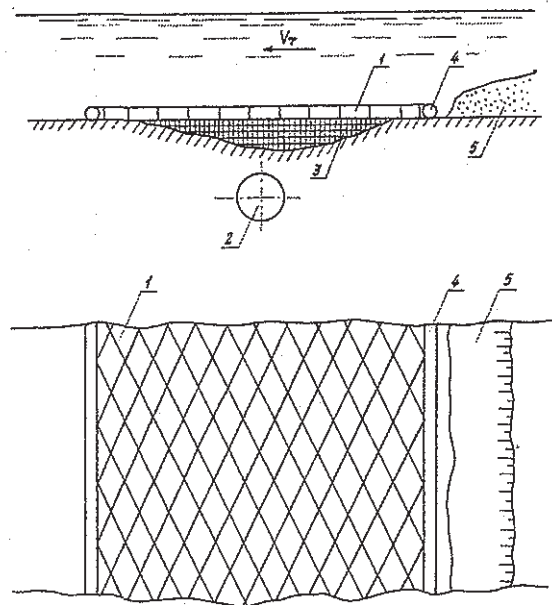


Figure 2. Protective cover.

AEC construction shown in Figure 2 which provides protection of a bottom section subjected to bed erosion, has three technological ways of functioning:

1. Preliminary filling of a washed out bottom section up to a full restoration of the initial bed topography with the following laying of antierosion construction onto the restored section. This way is used in cases of significant soil washing with water flow and demands obligatory underwater-technical jobs.

2. Laying of antierosion construction onto the washed out bottom section overlapping by its area the boarder-lines of wasout. The next step is filling an embankment (5) of loose material (sandy-gravel mixture, rock debris) higher river afloat along the boarder-line of the construction laid in such a way that in flood period, soil from the embankment filled the cellular voids of construction. In such a way the restoration of previously washed out bottom topography occurs. This way is used at the initial stage of channel erosion and for preliminary study of velocity parameters of the given river.

3. Laying of antierosion construction with the following process of natural deposit of silt transported with flow into the cellular structure of construction. The method is effective with the significant soil volume in a moving stream.

The laying of previously assembled elements of AEC is done with the use of floating means (pontoon, barges, floating cranes, etc.). Their choice and use depend on river dimensions and velocity of its flow.

The maximum river depth where AEC was laid according to specially worked out technology, was 9 m with the maximum flow velocity 1 m/sec.

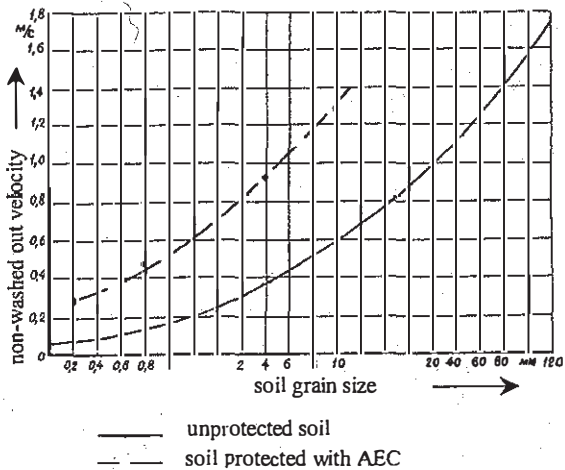


Figure 3. Diagram of experimental investigation results.

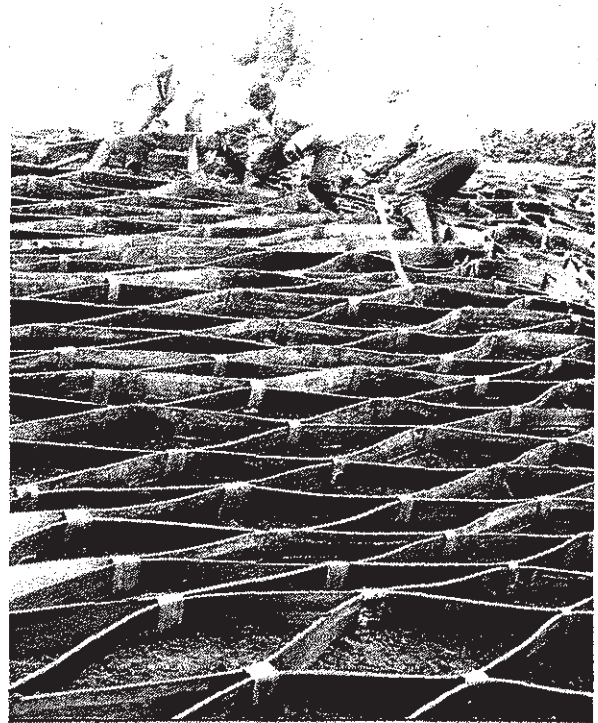


Figure 4. AEC laying.

2 CONCLUSIONS

A complex of experimental investigations carried out, as well as in situ survey of bed sections with the antierosion cover for a number of years, confirmed an efficiency of AEC. The results of above investigations are shown in a diagram (Fig. 3).

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