

SYSTEM FOR AUTOMATIC CATCHING AND GATHERING OF OIL POLLUTION

V.E. Savenok, A.A. Shishakova

Vitebsk State technological university, Vitebsk, Belarus

S.A. Chepelov

Vitebsk state university after P.M. Masherov, Vitebsk, Belarus

Increasing anthropogenous loading on environment leads to its pollution. Therefore, for all industrially-developed countries of the world, working out of new technologies of pollution abatement of environment is actual. An important link of a complex world problem of wildlife management is protection and rational use of water resources. Pollution of water ecosystems by oil and oil products, is now one of the main components of this problem. Ecological consequences of floods of oil have difficultly predicted character as it is impossible to consider all consequences of the oil pollution breaking natural processes and interrelations. Oil floods on water essentially change living conditions of all kinds of live organisms of water object. Influence of oil and oil products on water object is shown in deterioration of physical properties of water, a water poisoning with toxic substances, formation of a superficial oil film and a deposit at the bottom of a reservoir, lowering the maintenance of oxygen [1].

Now many technologies and the means intended for localisation and liquidation of oil pollution on water objects are developed. However, among them there are no enough effective remedies of double appointment which simultaneously both localised, and liquidated oil pollution and the petrosated sorbent from water objects.

For example, the device for gathering of oil from a water surface [2] which includes an infinite tape from a petroproof material with the cross-section folds, tense on leading and tension drums is known. Besides the device is supplied by a cylindrical squeezing roller and a petroreception tray. Folds absorb oil at tape movement through the pollution thus absorbing properties of a material of a tape do not change at a tape tension on drums. A device lack is its inability to catch and localise oil pollution.

The device for removal of oil products from a water surface [3] which includes a drum with the tape located on it executed in the form of the closed contour, placed on the bottom point of this contour the tension coil, the device for removal of oil products from a tape is known. The device is executed in the form of the cylinder which axis is located in parallel a drum axis. Also there is the reception tray established below the cylinder. The external surface of a tape is executed porous or can be fibrous. The cylinder is executed hollow with the punched lateral wall and established below a drum with gearing of a descending site of a tape with the cylinder. The device is not capable to localise oil pollution, its lack also is the small area of gathering of oil pollution, besides application of the given device on waterways is inexpedient since current presence on them does device work not effective.

The system for automatic catching and gathering of oil pollution [4] is known. The system contains, established at an angle to a direction of a current of a waterway, a slick bar. At bottom on a current of a waterway of an end face of a slick bar the settling capacity with an intake, having the waste device for tap of the cleared water back in the river more low on a current is located. The float slide gate an intake passes the polluted top sheet of water of the set thickness. The system provides productive and stable gathering floating on a surface of a waterway of oil pollution in the conditions of fluctuation of level of a water surface in a waterway. Lacks of the produced system is power consumption and complication of a construction as for its functioning it is necessary to construct synthetically to the in parallel basic waterway an additional waterway with a constant current and with the set discharge rate, thus the system constantly should be in operation, even at absence on a waterway of oil pollution. Besides, in the presence of a current, quality of gathering of oil pollution decreases, since with increase in speed of a current the size of oil pollution carried away under the check because a receiving device with a slide gate is not capable efficiently to assemble all oil pollution along all length of the check increases.

We develop system for automatic catching and the gathering floating on a water surface of oil pollution [5], which can be used for catching and removal of oil products from waste collectors, and also from a surface of open water currents of small width. The system includes a slick bar consisting of hollow floats between which the longitudinal horizontal strips forming together a horizontal jalousie, a conveyor belt with the modular shovels, established ahead a slick bar on the drums fixed on a frame and an intake with settling capacity are placed. The system also is supplied by two electric drives with two relays and the gauge.

The system works as follows. On a waterway establish a slick bar which hollow floats provide its buoyancy. Longitudinal horizontal strips of a slick bar connect obstacles draught to the electric drive, thus they in an initial condition are turned in such a manner that between them slot-hole backlashes through which waterway water freely proceeds are formed. Ahead a slick bar establish float the mechanical sensor which connect alarm wires to two relays of two electric drives. Then, also ahead a slick bar fix a frame on which fix with possibility of rotation of an axis of drums on which dress a conveyor belt supplied with modular shovels with springs between lateral surfaces of a waterway. A pulley of an extreme drum connect to a pulley of the electric drive chain transfer. To an opposite lateral surface fix an intake having settling capacity. The float slide gate an intake it is adjusted in such a manner that in the absence of oil pollution it closes water inflow from the water reception aperture (being on a water level in a waterway) in settling capacity. In case of water hit in settling capacity, at infringement of tightness of closing of a water reception aperture, water is taken away by a waste siphon in a waterway more low on a current for a slick bar. If in the water flowing on a waterway (a waste collector), oil pollution water freely flows through slot-hole backlashes between longitudinal horizontal strips of a slick bar do not contain. At occurrence on water before slick bar, films of oil pollution since the density of oil pollution is less than water density, works float the mechanical sensor and from it the operating signal on both relays stands out. One relay works and includes the electric drive which by means of draught turns longitudinal horizontal strips that provides closing of slot-hole backlashes a slick bar, as the further moving of oil pollution downwards on a waterway is prevented. Simultaneously works the second relay which includes other electric drive which by means of chain transfer actuates a conveyor belt. Modular shovels a conveyor belt move oil pollution to an intake, having reached a lateral surface of a shovel develop, and then, having passed a contact point, under the influence of springs, again accept vertical position. Oil pollution have density less, than the water density, therefore float slide gate starts to fall downwards, opening a water reception aperture through which oil pollution together with water arrive in an intake. The float slide gate reacts to a various thickness of oil pollution - the more a blanket of oil pollution, the falls float slide gate more deeply and more the water reception aperture opens. The increase in throughput of a water reception aperture is provided with additional adjustment of a float slide gate. In an intake water settles, and oil pollution accumulate in its top part, whence are pumped out by the pump equipment. The settled water falls downwards to settling capacity, and from it is taken away by a waste siphon in a waterway more low on a current for a slick bar.

Upon termination of gathering of oil pollution in reception capacity at absence in water of oil pollution, float the mechanical sensor emerges, its contacts are disconnected, work both relays which disconnect electric drives owing to what the conveyor belt stops, and longitudinal horizontal strips turn and between them slot-hole backlashes of a slick bar which provide an unobstructed current of water downwards on a waterway are formed.

It is necessary to notice that the bottom, not polluted layers of a waterway, at any operating mode of system proceed under боновым an obstacle free, as appointment a waterway does not decrease.

The system for automatic catching and the gathering floating on a water surface of oil pollution raises efficiency of catching and the gathering floating on a water surface of oil pollution in waste collectors and open waterways of small width at the expense of automation of process of catching and process of gathering of oil pollution. The given system is less power-intensive in

comparison with analogues. Its application will allow to lower an ecological damage at oil pollution of industrial and open superficial water currents.

THE LITERATURE

1. Savenok, V.E. Minimizatsija of an ecological damage at liquidation of emergency floods of oil. - «Bulletin PSU». Series F. Applied sciences. Building. №6, 2010. - C.103-107.
2. RU 2006549 C1, IPC⁵ E 02B 15/04, It is published 1994.01.30.
3. RU 02209876 C2 IPC⁷ E02B15/10, C02F1/40, It is published 2003.08.10.
4. RU 2151840 C1, IPC⁷ E02B15/04, It is published 2001.09.30.
5. The Demand for the invention a20121697 BY, IPC E02B 15/04. System for automatic catching and the gathering floating on a water surface of oil pollution / by Savenok V. E, Shishakova A.A., Chepelov S.A. the applicant Vitebsk state university after P.M. Masherov - a20121697; It is declared 05.12.12 // the priority inquiry of The National Centre of intellectual property Republic of Belarus from 11.02.13.