

## Environmentally compatible technology of peat extraction

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**Abstract.** It is possible to receive peat from it such useful products as fuel, fertilizers, heat insulating, metallurgical fuel, sorbents, building materials, etc. In comparison with traditional methods of extraction using the offered equipment and developed technological schemes for industrial production of a peat will allows to avoid actions on drainage of developed fields, to lower negative influence on change of a natural hydrological mode of bogs; to reduce volumes of the compelled deforestation; to raise labour productivity of workers; to reduce expenses for preparation and operation of a peat deposit; to prolong a season of mining activities, and in some cases to provide an opportunity of all-the-year-round operation of a deposit.

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### Introduction

Peat is a combustible mineral which formed in conditions of bogs from short decayed rests of plants (at a small degree of decomposition the fibrous structure, at a high degree of decomposition plastic structure) contains up to 60 % of carbon [1]. It is renewable resources. Annually in the world about 3,0 billion-m<sup>3</sup> peat is formed, that approximately is 120 times more, than it is used. Russia and Canada have the greatest known reserves of peat. For last years world volumes of peat production were reduced approximately twice, repeated falling of one of the Russian peat causes that. As to other countries volumes of productions as a whole has increased for 10 %. For today the largest manufacturers of peat production in the world are Finland, Canada, Germany, Ireland, the Baltic countries and Russia. In the Russian Federation is concentrated more than third of world reserves of peat resources.

For years of peat industries development in the different countries of the world some directions of peat using and peat production have appeared and develop.

Fuel peat is popular mineral from which it is possible to receive as traditional (domestic fuel, fertilizers, heat insulating and soundproofing materials), and new kinds of production (metallurgical fuel, active coals, sorbents, building materials, stabilizers and liquefier of natural materials, medical products, etc.). This circumstance does the Russian reserves of peat strategic for the future generations. For this reason last years the set of various normative documents at a level of the Russian Federation government that adjusting the account and the reporting, safety of these resources, their development and use is published.

Peat resources are explored in 63 subjects of the Russian Federation in seven federal districts. Peat resources on territory of the country settle down non-uniformly, that speaks not only their actual arrangement, but also an extent of exploration. In northwest federal district 36,2 % of the all-Russian resources of peat are concentrated. The largest deposits are in Western Siberia [2]. The world's largest and unique on the parameters is Vasuganskoe a deposit located in central part of West Siberian lowland, within the limits of Novosibirsk, Tomsk, Omsk and Tyumen areas.

It is known, that the power component borrows up to third of all volume of the Russian freight traffic. Decrease in this share can be reached by development and use of local energy sources and in particular fuel on the basis of peat. In favour of increase in a share of peat in a fuel and energy complex presence that in our country there are huge quantity of small settlements which boiler-houses work at an imported corner and black oil that also leads to rise in price of thermal energy. It is necessary to note, that according to Committee of the State Duma on power, transport and communication potential stocks of peat raw material in the country are huge and make 68,3 billion tons, concede only to coal (97 billion tons), but exceed total stocks of oil and gas in Russia (31 billion and 22 billion tons accordingly). Comparison of the prices for peat fuel with the prices for other kinds of fuel testifies to advantage besides peat. For example, for northern areas of Russia if to accept cost on peat for 100 %, the price for Kuznetsk coal will make more than 190 %, on the Vorkuta coal - 130-185 %, on black oil - 180-252 %. Essentially this parity is kept and for all European part of the country [3].

It is obvious, that on a background of the Russian richest raw-material base, from all extracting industries only peat industry has appeared in the deepest long-term crisis. The objective reasons of similar decline of branch were distinctive features of the peat industry. It is branch where both extraction, and processing of a mineral are conducted open-air. Extraction and processing of peat carry a strongly pronounced seasonal nature. Both the raw material, and products of its processing are subject to atmospheric influence and quite often lose a packaging [4]. Hence, factory processing of peat raw material is a first step to revival of branch where processes of extraction and processing will separately pass and independently from each other.

Let's note, that high quality of new kinds of fuel on the basis of peat is provided exclusively due to transition from field to shop conditions of its manufacture, and also use of various ways of modifying of raw material. In an equal measure it concerns as to technologies of reception formed (lump fuel), and pressed fuel (compressed fuel). Now there are many projects of fuel manufacture on the basis of peat and various waste, therefore, in view of a real situation on presence of those or other raw components, their volumes, availability, to quality they easily adapt for concrete territories, to structure of consumers, etc. Besides, in a shop conditions there are possibility of advanced processing of raw material [5].

At transition to shop conditions of peat fuel development technologies of extraction of raw material essentially become simpler, the need for preparation of fields for extraction and drying of peat in field conditions, stoking, storages and transportations of production decreases, dependence on weather conditions, fire danger, etc. In some cases such technologies essentially decrease can be shown to small-scale all-the-year-round extraction of peat by excavator or milling peat of the raised humidity. Hence, the size of capital investments essentially decreases, and investment appeal of such projects increases.

In case of development strongly watered field known peat technologies involve full forest liquidation and grubbing, partial or full land improvement. As a result of such activity the natural hydro-geological mode of bogs is broken, there are declining of ecological situation.

As it has been told earlier, modern methods of peat processing allow using raw material with high humidity. It is obvious, that in that case fields drainage actions seem excessive [6].

The metal-intensive equipment and used technological schemes in peat processing don't allow extracting peat without preliminary meliorative

actions that pushes into the foreground a problem of creation new technological schemes, self-mobile mining equipment and complexes. Because of conditions of peat mine position in remote for transport and processing equipment areas, and also impossibility to use any other production and transportation methods, the main distinctive features of new machines should be - buoyancy, self-mobility and universality.

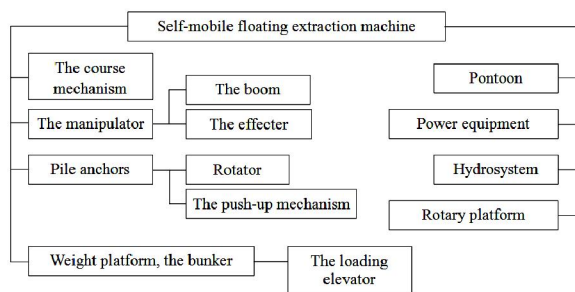
Buoyancy of created production complex is provided with pontoons. It is necessary to allocate three types of machines that are to use in complex for mechanized peat productions in conditions strong watered fields:

1. Self-mobile floating extraction machines;
2. Self-mobile floating universal machines for deposit preparation for peat production;
3. Self-mobile floating loads pontoons for mineral delivery from a face to item of stoking or an overload.

Cyclic or continuous action machines can carry out for extraction of a mineral. At creation self-mobile floating extraction machines in parallel are considered both of a variant of effectors.

Extraction of peat by self-mobile floating machines assumes production of a mineral from under water surface. Use traditional methods of excavation can appear rather effective on small depths. In process of depth increase inevitably there will be a problem of partial or full washout of the taken volume of a mineral at its moving through water thickness from a face to the transport machine. Realization of a continuous way of extraction assumes preparation peat up to condition with had possibility to its delivery from under surfaces of water by hydrotransport. Such way of extraction is more difficult in realization and demands installation additional devices for reduction of peat humidity. The continuous way of extraction can be realized with use outside water in hydrotransport unit. Water is dumping after peat unwatering [7].

Self-mobile floating extraction machine with cyclic action includes: a floating platform - a pontoon; a rotary platform with the installed manipulator and a quick-detachable closed shovel or with a screwing bunker effector; the bunker or a weight platform; loading elevator; the power equipment. At self-mobile floating extraction machine with continuous action in comparison with the machine of cyclic action instead of a shovel on the manipulator have selective effector - drum-type, aggregated with mud pump [8]. On a pontoon the device for preliminary unwatering the extracted peat is established. The block diagram of floating extraction machine is presented on fig. 1.



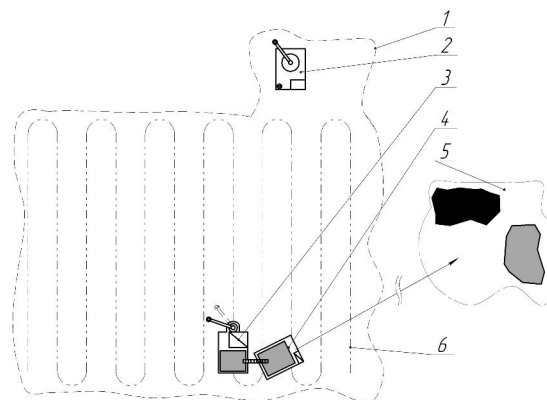
**Fig. 2. The block diagram of floating extraction machine**

The overload of the produced peat out of extraction machines, that in the first, that in the second case is carried out in self-mobile floating loader pontoons for delivery of a mineral to item of stoking. Because of extraction machine has a weight platform and elevator. Loading of transport pontoons can be carried out irrespective of extraction process.

The technological scheme of working off a peat field with use a developed complex of mechanical equipment can be described as follows. Preliminary preparation of lands under peat extraction including technologically necessary forest liquidation, making access lane, clearing of boggy territory. Production machine is placed above a face and fixed by pile anchors. Moving of a face realized cyclically. The peat deposit is cut within reach of the executive equipment then the machine moves on a step of a face. The gotten mineral (after preliminary unwatering or without this) collects on the extracting machine (on a weight platform or in the bunker). As required peat is overloaded on transport pontoons and loading to place of stoking and sorting and further by automobile or other type of transport to processing plant. The described technological scheme of the works organization on peat extracting is presented on fig.2.

Peat bogs are objects that interesting for many segments of industry such as: energy industry, a farming and hunting, forestry, water, environment conservancy. Peat bogs absorb carbon counteracting a carbon dioxide effect. Preservation of natural properties and useful functions of peat bogs for the subsequent generations the important macroeconomical problem [9,10]. In comparison with traditional methods of extraction using the offered equipment and developed technological schemes for industrial production of a peat will allows: to avoid actions on drainage of developed fields, to lower negative influence on change of a natural hydrological mode of bogs; to reduce volumes of the compelled deforestation; to raise labour productivity of workers; to reduce expenses

for preparation and operation of a peat deposit; to prolong a season of mining activities, and in some cases to provide an opportunity of all-the-year-round operation of a deposit.



**Fig. 3. The technological scheme of works organization:**

**1 - borders prepared fields; 2 - self-propelled floating universal machines for preparation of a deposit under extraction; 3 - self-propelled floating unit; 4 - a cargo pontoon; 5 - a platform of warehousing and sorting of a mineral; 6 - a trajectory of movement the unit**

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