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Organic waste for water reservoirs ecological improvement

Methods and means of oil-contaminated waste waters purification were analyzed. Oil sorbents manufacturing from raw plant material were considered. Impact chemical treatment on oil sorption of sawdust was presented

The main component of environment is rational using water resources. Volumes of usage of fresh water are continuously increased, but water resources belong to exhaustible too. The deficit of fresh water is connected with irrational usage of water by all branches of national economy, and with large water's losses through using of equipment, which is characterized by higher degree of wear today. The resource saving problem is defined yet by effectiveness of waste waters purification of enterprises of different forms of activity, because namely waste waters are one from reasons of unsatisfactory Ukraine water conditions.

Waste waters of Ukrainian enterprises have a big quantity of different polluted matters. Oil and products of its refinement are particularly dangerous. So the waste waters of airport "Kyiv" (Gulyany) have the most part of pollutions as petroleum products from runway strips, bearing tracks and places of airships stop. All sources of pollution of waste waters, which include and oil pollutions can be liquidated by the means of purification systems organization on the enterprises and repeated using of waste waters. Technological purification system of oil-contaminated water on the fuel-supplying enterprises, as a rule includes different devices of waste waters purification.

In the sand trap the sedimentation process – separation of mechanical admixtures with sizes 200-250 my takes place. In sedimentation reservoirs – the sedimentation of slip takes place. After the first and second purification degree settled waste waters are supplied to the third purification degree – the oil trap. In the oil trap the purification of waste waters from main mass floating petroleum products takes place and the sedimentation of mechanical admixtures too. On the fourth purification building the sorbtion purification of waste waters from petroleum products takes place. The sorbtion purification method can be used as independently as in the complex with other methods. The effectiveness of purification by sorbtion method is 99%.

Sorbtion methods of waste waters purification are based on using of natural and unnatural sorbents. Sorbents, which are used for waste water purification from oil contaminations must be corresponded to many requirements: firstly, presence of enough material base, secondly, the high hydrophobicity and oil capacity, thirdly, possibility of regeneration and utilization and, fourthly, comparatively low cost.

In the waste waters purification system, which has being under discussion is used graphite sorbent, which doesn't provide the needed degree of waste waters purification for throwing off into the surface water. The measurements of content of petroleum products in the tests of waste waters of airport "Kyiv" were conducted by us. For measurement of petroleum products concentration in the water the standard

ГОСТ 38.01378-85 was used, on the base of method of liquid-phase extraction concentration of petroleum products by chlorine carbon. Thus we obtained solution of petroleum products in the four chlorine carbon, evaporating on the water bath. That's why it's need to use more effective materials like organic natural sorbents. For example, a kilogram of sawdust can absorb up to 5 kg of petroleum products, a kilogram of sunflower husk - up to 7 kg, and cotton waste - up to 18 kg of petroleum products. Most of them absorb petroleum products without further treatment with chemical solvents, without which it is impossible to do without the use of inorganic sorbents (kaolin, perlite), and with the use of elevated temperatures. Such sorbents as sawdust, cotton waste can be used at all without any additional treatment.

On the basis of literature analysis [1-5], the author established the main parameters that have a direct influence on the oil content of the sorbents. Oil capacity of sorbents depends on:

a) the origin of the sorbent, including its porous structure;
b) temperature influence (heat treatment);
c) the influence of various modifiers (chemical treatment);
d) the degree of dispersion of the sorbent;
e) the type of oil to be absorbed;
f) the phase state of the petroleum product;
g) the concentration of petroleum products.

Promising method of manufacturing sorbents from raw plant material is chemical reagents treatment. The influence of mineral chemical compounds and organic acids on sawdust oil sumption is presented in Tables 1,2.

Table 1

Oil sumption of sawdust after mineral acids treatment

Reagent	Concentr. of reagent, %	Oil sumption, kg/kg	Oil sumption increasing, %
Sawdust	–	4,3	–
Hydrochloric acid	10	5,0	16
Phosphoric acid	10	5,3	23
Azotic acid	10	4,4	2
Sulphuric acid	1	5,2	21
Sulphuric acid	5	6,2	44
Sulphuric acid	10	6,6	53
Sulphuric acid	25	5,0	16
Sulphuric acid	70	4,0	7
Sodium hydroxide	10	5,0	16

Table 2

Oil sumption of sawdust after organic acids treatment

Reagent	Concent. of reagent, %	Oil sumption, kg/kg	Oil sumption increasing, %
Sawdust	–	4,3	–
Sulfanilic acid	10	5,0	16
Sulphosalicylic acid	11	6,3	46
3-ethanol-hydrochloride	10	2,0	115
Grease	10	3,6	19
Benzol extraction of peat	10	5,0	16
Glycerin	10	4,5	5
Paraffin	10	8,3	93

The given results (tabl. 1,2) show that the influence of organic compounds on initial material is different, and the range of obtained results is rather wide. Due to this new opportunities and perspectives of organic compounds application for the improving of sawdust sorption rate as the raw material for oil sorbents appear. The main disadvantages of raw plant material chemical treatment are, mainly, toxic level and the complicity of the process.

Conclusions

Ecological problems solution, in particular water purification by means of either existing methods improvement or developing the new methods of oil sorbents production from raw plant material, becomes evident. The scientific research of this paper becomes determinative for efficient use of the resources in our country and the objective utilization of raw plant material.

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