16th INTERNATIONAL MULTIDISCIPLINARY SCIENTIFIC GEOCONFERENCE SGEM 2016

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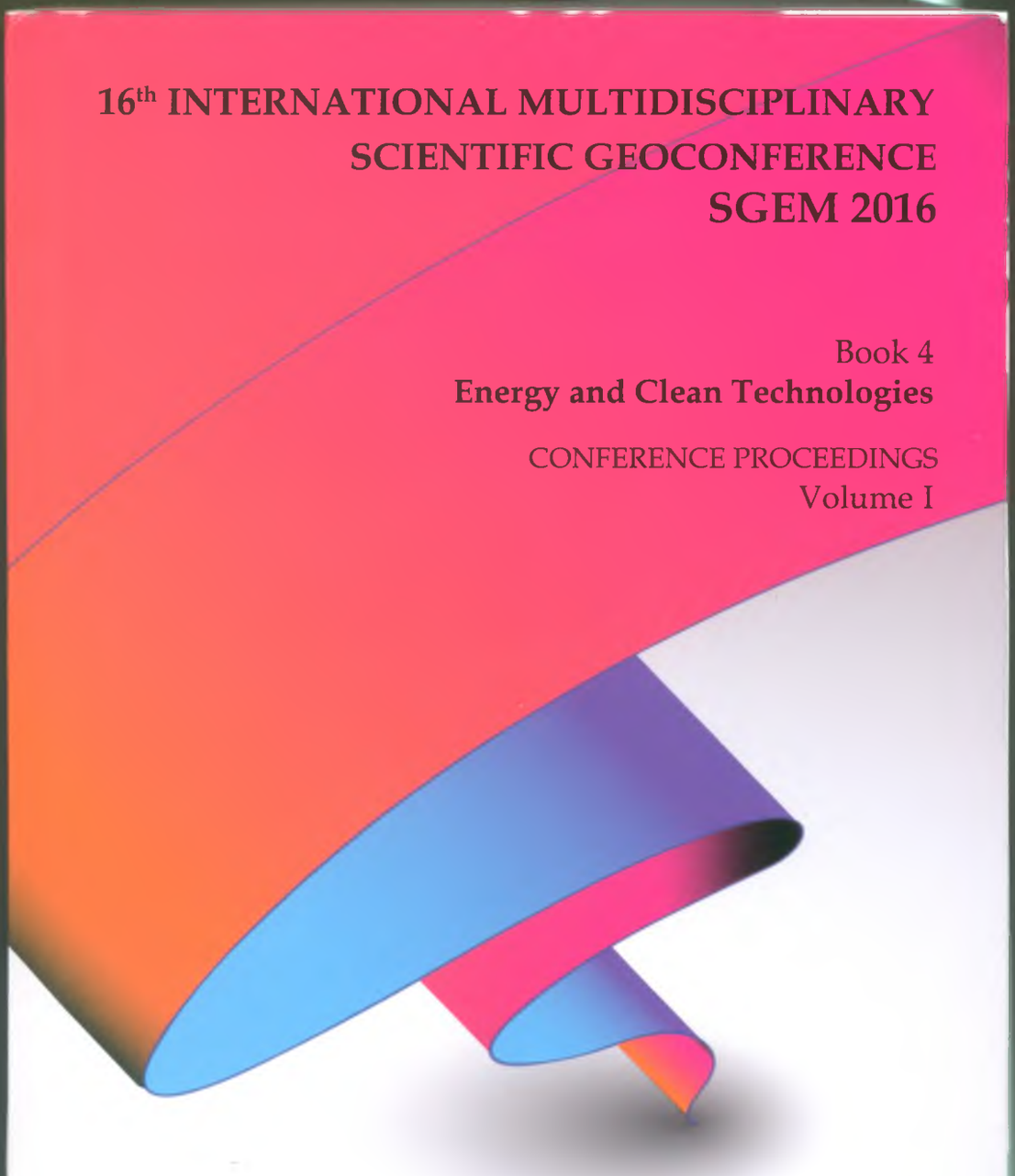

NUCLEAR TECHNOLOGIES

RENEWABLE ENERGY SOURCES
& CLEAN TECHNOLOGIES

16th INTERNATIONAL MULTIDISCIPLINARY SCIENTIFIC GEOCONFERENCE
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30 June – 6 July, 2016
Albena, Bulgaria

INTEGRATED OIL WASTE PROCESSING WITH USING SOLAR ENERGY

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ABSTRACT

The article describes in detail the processes of complex processing of oily waste using solar energy. This is consistent with the new technological and economic requirements, oil waste management and waste from oil and gas industry prevention and timely elimination of the consequences of oil spills and oil products. An important role is played by the possibility of extraction of oily waste of valuable hydrocarbon components and their further use as secondary raw materials. With using the complex technology of processing of oily waste should be applied harmless from an ecological point of view of technology, eliminating the possibility of secondary pollution. Developed the helio devices equipped with concentrating elements to extract oil in the purification of waste oil. In the given article offered the solutions to the issues of the practical application of pre-treated contaminated soils and sludge to strengthen pavements. The results of a pilot study on the production of soil-concrete on the basis of oily waste. The structures of soil-concrete made on the basis of oil-contaminated soil and sludge.

Keywords: helio devices equipped with concentrating elements, cleaning of waste oil, oil extraction, disposal of oily waste, structure of soil-concrete

INTRODUCTION

Every year in the world produced about 3 million tons of sludge, and in Kazakhstan, over 100 thousand tons. Significant loss of oil from oil sludge and their negative impact on the environment of the region creates the need to develop technologies for processing sludge. Sludge processing methods involves their thermal, chemical or biological treatment, which in turn is characterized by the release of large quantities of toxic gases, the use of expensive chemical reagents or biological strains. The authors proposed a method of cleaning oil contamination of waste with the use of solar energy, is carried out on they developed Helio device equipped with concentrating elements.

A wide range of compositions of oily waste requires the development of cost-effective and environmentally efficient technologies to solve complex use of hydrocarbon resources of oil sludge. Most developed solutions for disposal of oily waste leads to the loss of the resource potential, and only some of the existing technology provides a secondary hydrocarbon feed or low-quality oil products trade [1].

It was developed a combined method of processing oil waste and a device for separating organic and mineral part of oil waste. Designed oil waste processing method includes feeding the feedstock into the heating zone and out of the solid residue, thus in the heating zone

maintained at a temperature above 75°C flow able state until the raw liquid followed by separation of the organic part of the solid residue.

In the first phase of the first cycle of cleaning soil from oil products starts with preparation of contaminated soil (soil, sand). Preparation of the contaminated material is to load and sorting of large inclusions (for example stones), and their removal. For this purpose the rumble which used is widely in the mining industry.

Then, the contaminated material is stirred with water. This may be used, milling and jet mill MJM-7, widely used for preparation of drilling fluids during drilling for oil and gas. This results in thinning and grinding lumps of contaminated material, grinding fine wood residues and vegetation.

Thus, there is sorting, grinding and removal of large particles, such as stones larger than 100 mm; remove the wood and vegetation, thinning and grinding lumps of contaminated soil (soil, sand) bitumen inclusions. Then the liquefied mass is sorted to remove stones larger than 5 mm. To do this, use a rumble with an underlying tray-funnel.

The helio device that allows you to clean 10 kg/h oil-contaminated waste consists of the following parts: 12 series-connected solar panels; controller; Monitoring devices with the software; batteries; capacity for cleaning oil-contaminated waste; inverter; helio tracker; cylindrical parabolic concentrator; electric heater; actuator arm.

Cleaning of waste is carried out on the helio device equipped with a cylinder fixed inside the radiator solar collector. The radiator is made in the form of a tube made of copper and is used for circulating the coolant (a mixture of antifreeze and water), having an inner diameter of 30 mm or more. The helio device is further equipped with a solar panel made of concentrator photovoltaic modules placed on a mechanical system that provides additional warmth missing in the overcast and cold season, as well as parabolic cylindrical hub, which in turn virtually lossless collects all the sun falls on him energy in the focal point, where the copper pipe, with the orientation of the sun with the help of the tracking system. Thus, a device for collecting solar heat promotes maximum temperature of coolant at a given time. After heating using the oil productive coolant received in the reservoir is drained to the collection of oil through the pipe connected to the device body [2].

In order to create conditions of displacing oil from waste oil sludge and oil-contaminated soil mixed with water, which is first in the unit volume of 30 dm^3 filled with 20 liters of water and laid on top of 10 kg of oil-contaminated soil or sludge. The focus of the case on a metal frame mounted parabolic concentrator equipped with a tracking system of the sun, which is focusing most direct and diffuse solar radiation, it collects all the incident solar energy on it.

After saturation of the soil water through the mixer channels are formed through which during heating by solar energy, become prominent petroleum fractions with water. The resulting oil productive with water through a pipe connected to the housing merges into a separation column where the oil fraction is separated from the aqueous solution. After draining the water solution is sent again to the device for cleaning the next batch of waste. Time of phase separation in the column that is 10-15 minutes every 15 minutes of circulating water is ready for cleaning waste. The separation column is made of the material absorbs heat, so the temperature of the liquid in the column is kept within 60-80°C, which allows efficient separation of oil products, mainly heavy oil. The water, having a temperature of 60-80°C sent to the device thus ensuring rapid allocation of oil products from waste. The day is carried out 6-8 parts download oil waste into the

device (60-80 kg a day) in the active time of day. After passive action of solar radiation cleanup work is completed. The given below Figure 1 illustrates a principal scheme helio device.

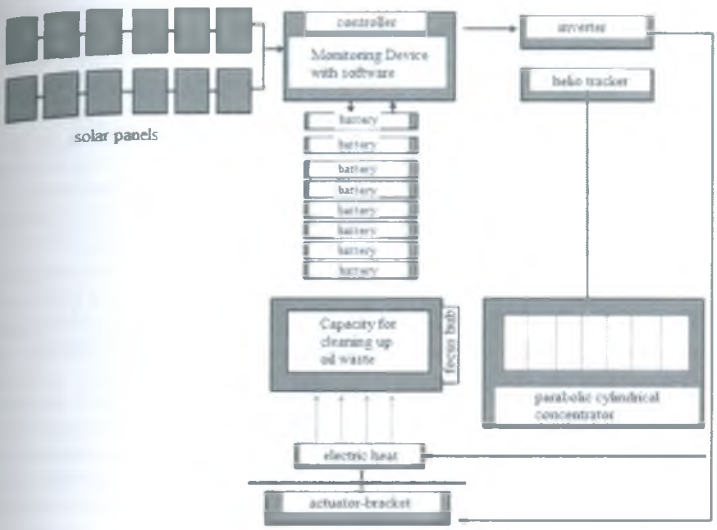


Figure 1 – The helio device equipped with concentrating elements

Figure 2 is a schematic flow diagram of sludge through heat treatment in helio device.

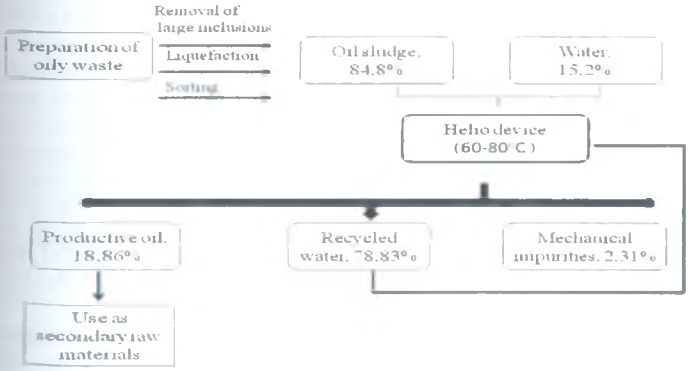


Figure 2 – Passing through oil sludge thermal treatment in helio device

When heated polluted soil temperature in the device is 85°C at an ambient temperature of 28°C, the heating is carried out for 1 hour, and the use of additional energy accumulated by the solar panel, the heating time is reduced by 2-2.5 times.

The main purpose of the helio device is impact natural solar radiation flux density varying with significant involvement in this process is solar energy concentrator provided with a system for tracking the sun, the maximum of the focusing solar rays, where in the heat sink in the form of a copper tube located on the focus of the cylinder is cooled, absorbs and stores heat. Practical implementation of the optimal combination of concentrator solar energy in the form of cylindrical shape equipped with the tracking system of the sun, which collects all the incident solar energy to it, promotes maximum focus of direct and diffuse solar radiation, even a low density, and additionally used solar panel provides the missing heat in cloudy and cold seasons, thereby improving the heating and shrinking process [3-4].

The practical value of oil-contaminated soil and sludge is its use to strengthen road surfaces. Due to the marked promising direction we have developed a process waste polluted soil and sludge in road construction. Using a new method of pre-treatment of oil-contaminated soil and sludge using solar energy saving petroleum products (in the cleaning process further obtain oil) and astringent, which are used in road construction, reduce the cost of processing of liquid and solid oil waste disposal, to minimize transportation costs and other. The soil-concrete manufacturing technology for road construction is carried out in the following order. First oil-contaminated soil or slime was pre-treatment with the use of solar energy in the device with the elements concentrating solar energy to separate the contaminated soils from heavy fractions of the hydrocarbon. We have created a new technical solutions aimed at obtaining high-quality soil-concrete with the use of solar energy and expanding resource base of soil due to the use of oily waste production and reducing the consumption of cement and lime exceptions. Designed include soil- oily waste, cement and sand, characterized in that the waste is used as the oily sludge and oil contaminated soils containing up to 10 % oil and 90 % of suspended solids and as a mineral filler - sand where in the ratio of components in soil- , %: Oily waste (oil-contaminated soil and oil sludge) - 60 %; sand - 27 %; Cement - 13 %.

To prepare a soil-mix pre-purified contaminated soils or oil sludge is first mixed, then by dosing mixed with sand, stirred until a homogeneous mixture was then added binders, stirred again and a concrete additive and then introduced and finally mixed and moistened to a moisture content of the molding the desired degree of homogeneity. The composition of the investigated soil-concrete composite mixture on the basis of oil-contaminated soil and sludge: structure - 1:4:2. In formulations based on oil-contaminated soil and sludge used concrete admixture based on sulfuric synthetic polymer that provides super strength, decreases in the largely water content reo-plastic concrete containing no chlorine, which initially accelerates and increases the strength of concrete [5].

For the pilot study, we have developed the experimental and control samples of the two formulations for soil-concrete mixture, using oil-contaminated soil and sludge. In order to heat treatment, the test samples were subjected to heat treatment in an apparatus with elements of concentrating solar energy and control samples hardening occurred in vivo.

Table 5 - Composition of soil-concrete on the basis of oil-contaminated soil and sludge

Number of samples	The composition of soil-concrete (experimental sample-heat treatment with the use of solar energy)	Number of samples	The composition of soil-concrete (control - hardening in vivo)
With the use of oil-contaminated soil			
2	Contaminated soils Cement Sand Water Concrete additives	22	Contaminated soils Cement Sand Water Concrete additives
Using oil sludge			
4	Oil sludge Cement Sand Water Concrete additives	44	Oil sludge Cement Sand Water Concrete additives

After the heat treatment in the soil-concrete helio device with a translucent shell, physical and mechanical properties of experimental samples of soil-concrete had the following values shown in Table 6. According with table 5, samples number 2 and 4 of soil-concrete comply with quality of instruction to meet the requirements of the stabilized soil two strength class.

Table 6 – The physical and mechanical properties of the experimental and control samples soil-concrete after 28 days of hardening

Name indicators	According to building codes and regulations, 2 strength class	The value of technical indicators			
		Contaminated soils		Oil sludge	
		2 experimental	22 control	4 experimental	44 control
The compressive strength of saturated samples, mpa	6-4	5,73	3,1	5,33	3,70
The tensile strength in bending samples saturated with water, mpa, not less	1.0	1.6	0,86	1,50	0,76
Coefficient of frost, not less	0.75	0,81	0,55	0,80	0,53

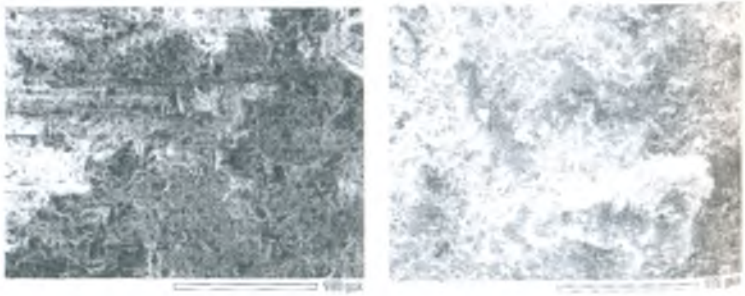
The most soil-concrete compressive strength of 2 on the basis of oil-contaminated soil, and 4 on the basis of sludge is due to the selection of the correct composition: complex sand and additives, the presence of an organic part of the compounds with unsaturated chemical bonds, which increases their reactivity, as the use of pre-treated contaminated oils or sludge, as after pre-treatment molecular weight hydrocarbons close

in magnitude to the bitumen, and the ratio of carbon to hydrogen varies according to the given row, bitumen (6.29 - 10.7) > polluted soil and oil sludge (8.56 - 8 79). In soil-concrete made on the basis of oil-contaminated soil or sludge priority tensile strength in bending is due to tar providing adhesion, elasticity and cohesive bonds (Table 7).

Table 7 – The soil-concrete strength by heat treatment using solar energy

Number of samples	W/C	Tensile strength in bending	Compressive strength, MPa age day			
			1	7	14	28
1	2	3	4	5	6	7
Contaminated soils						
2	0,5	1,6	1,07	1,7	3,74	5,73
22	0,5	0,86	0,11	0,75	1,55	3,1
Oil sludge						
4	0,5	1,50	1,01	2,36	3,70	5,33
44	0,5	0,76	0,13	0,93	1,85	3,7

In accordance with the above stated optimum compositions can be recommended according to the instructions for building a foundation or as a coating of local roads. They can also be recommended as a basis, performing the function of a crack - interrupting layers. This improves the technological properties: workability due to the presence of plasticizers - oil, and hence the homogeneity and workability. Increase operational performance: compressive strength and tensile, frost resistance and deformation capacity through the use of cement, providing crystal structure space frame which occurs in soil stabilization. This is due to the fact that the oil has a coagulation structure, and the presence in it of cement provides mixed coagulation- crystal structures of soil with a real possibility of obtaining soil-concrete with high physical and mechanical properties [6]. In the Figure 2 presented the microstructure of the experimental (a) and control (b) soil-concrete samples made on the basis of polluted soil.



a) b)

Figure 2 - The microstructure of the experimental (a) and control (b) soil-concrete samples made on the basis of polluted soil

Extensive use of recycled materials, such as waste oil production is dictated by both the feasibility and the modern environmental requirements. Economic and environmental feasibility of recycling waste, including oil-contaminated soil and sludge increases, since they contain more components suitable for highly sought-after building materials, road-building materials (soil-concrete). At present, the growing importance of lightweight, transitional and lower road types with the use of soils and soil-reinforced mineral binder. The developing of the road network in the regions of Kazakhstan refineries due to the use of local materials, which include overburden for oil, waste drilling mud, sludge oil production and transportation of oil. Such waste is usually deposited in open areas, landfills, occupy large areas, environmentally unsafe and processing is becoming increasingly important.

CONCLUSION

An alternative method of waste management of the oil industry solar radiation to prevent the environmental damage estimates can: prevention and elimination of consequences of negative processes; environmental safety of the oil industry; timely and effective implementation of measures to control the state; identify and minimize the environmental risks associated with the occurrence of man-caused emergencies. Social benefits achieved improved ecological conditions of area of oil through the utilization of oil-contaminated soil and sludge and reduce the environmental impact on the environment, rehabilitation of areas polluted by oil waste, as well as appeal to non-traditional sources, observed around the world, explains how limiting traditional energy sources, and more critical environmental conditions, caused by the burning of fossil fuels and the emergence of the so-called "greenhouse" effect. The use of renewable energy and converting them in the most convenient forms: electricity and heating costs today is extremely expensive. However, the difficulties that await humanity in the case of increasing or maintaining the rate of growth of the negative impact on the environment as a result of industrial activity and energy production, and are forced to seek means to develop research aimed at improving the efficiency of clean energy, primarily solar. Soil- structure based on the proposed use of different renewable energy sources, including solar energy, reducing energy consumption, low cost, and decides on disposal of oily waste. Developed environmentally friendly soil-concrete can be used in building a foundation of roads with minimal energy and labor costs.

ACKNOWLEDGEMENTS

This article was written as part of research grant funding Ministry of Education and Science of the Republic of Kazakhstan on the theme: "Development of methods for extracting oil in the purification of waste oil using the helio device equipped with concentrating elements."

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INTELLIGENT BUILDINGS AND TECHNOLOGIES

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ABSTRACT

Creating quality work and home environment in intelligent building is oriented mainly to create atmosphere without stress incentives for residents. It is also important to meet the needs of people. The meaning of intelligent building is necessary to know the design. It is necessary to know what influences the optimum level of intelligence and negative effects. This causes discomfort. This phenomenon ultimately has a negative impact on performance and employee productivity. Intelligent building technology connects buildings from lighting through heating control, security systems and multimedia. The aim is to make effective use of energy while saving. Achieving the needs of the user allows the creation of high-quality intelligent building, which according to the degree of intelligence may or may not include a building automation system. Because even the most powerful and most advanced automated control does not make the building more efficient as technology not fully exploit the potential of the building structure, the environment and the individuality of people.

Keywords: intelligent, technology, heating, cooling, thermal comfort

INTRODUCTION

Intelligent building combines a sensible approach to architecture and aesthetics, construction, safety, comfort, environment. These buildings are productive, energy efficient and environmentally acceptable. Intelligent buildings combine internal and external intelligence of building, intelligence of materials and structures, and it is all backed by psychological and health aspects. What exactly is intelligent building? Intelligent buildings should be permanent, healthy, technologically advanced, they should comply with requirements and needs of the people, it should be flexible to the changes you want. The role of intelligent buildings is also using its built system to create high-quality internal and external environment while meeting environmental and effective values. This means that the design, construction, technical equipment and building management should be on one level. The most important aspect is the cooperation of people with these systems. System thinking is necessary in the design and management of buildings with talent who create, innovate and remain mostly practical and is always focused on maximum simplicity. The most important function of the building is to create a suitable environment for humans [1], [6].

Intelligent building technologies (fig. 1) enable dynamic optimization in real time and facilitate an operating management compared to traditional solutions. The basic division is in two areas: