





# **«PURE WORLD»**

- COMPLEX FOR CLEANING OIL AND OIL
   PRODUCTS STORAGE TANKS
- OIL SLUDGE REFINERY COMPLEX

• WATER CLEANING COMPLEX





#### 1. About "Pure World" Group of Companies

Continuing advance of technologies in the world, requires constant increase in the use of crude oil and gas. Thus, consequently, leads to the formation of an enormous amount of oil wastes and contaminations in oil tanks, settling ponds, oil sludge pits, sea and river tank vessels, at the oil refineries, tank farms and storage terminals. Reason behind such situation lies in the following: absence of the regular tank cleaning works done at the oil exploitation fields, oil and oil products refining and storage areas; absence of modern cleaning stations for river and sea tank vessels and railway tank cars; use of manual cleaning methods at the above-mentioned facilities and absence of modern equipment ensuring zero-waste technology eliminating hydrocarbon contaminations.

"Pure World" Group of Companies was established in 2001, putting together skills and knowledge of scientists, manufacturing and service enterprises with an aim to create new perspective technologies for cleaning various facilities from hydrocarbon (oil) contaminations.

Presently, Pure World Group of Companies comprises scientists, designers and specialists in different scientific and technological domains. The company possesses a modern scientific and research base comprising research laboratories, design subdivisions, production base and research sites.













From the concept and laboratory studies to the finished product and services



#### PURE WORLD GROUP OF COMPANIES

#### We work in:

Russia, CIS countries, Europe, the countries of the Persian Gulf, Africa, Latin America and Asia.

#### Our clients:

Lukoil, Rosneft, Transneft, Gazprom, Tatneft, Gaspromneft, Bashneft, TNK-BP, Shell etc.





Вручение Диплома и Золотого Знака «Российская марка»

Вручение Диплома и Знака Лаурета премии Правительства Москвы в области защиты окружающей среды



Дипломы и награды Группы компаний «Чистый Мир М» полученные за разработку и внедрение безотходной технологии очистки от нефтяных загрязнений

#### **CUSTOMER FEEDBACK**





The equipment and technologies, developed by scientists and specialists of the «Pure World» Group of Companies, are protected by patents. The enterprises of the «Pure World» Group of Companies are exclusive manufacturers of mobile and stationary complexes of a new generation, suitable for cleaning various objects from oil contamination.



The equipment developed by the specialists of "Pure World" group of companies is provided with all the necessary permissive documents.



#### **COMPANY PROFILE**





### **KEY ADVANTAGES OF TANK CLEANING WORKS WITH THE MKO-1000 COMPLEX**

- lower power consumption (4-6 times) and water consumption (by several dozens of times);
- multiple use of technical detergents in the washing cycle;
- reduction of production wastes requiring disposal or recycling;
- environmental, fire and explosion safety;
- cleaning quality allows for change of the oil product, and after forced degassing - fire works;
- the absence of harmful waste discharge to the environment;
- closed nature of technological process;

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- the distance between the Complex and the facility up to 100 m allows for servicing of tank and reservoir groups;
  - the absence of chemical interaction and chemical effect of the working solution onto oil products, soils and structural materials;
  - considerable reduction of work performance time and minimized manual labor during washing;
  - brand-new technologies and work methods with MKO-1000 ensure safe works for the maintenance personnel and strict compliance with the industrial safety, occupational safety and environmental protection regulations.



### THE CHARACTERISTIC PROPERTY OF THE CLEANING METHOD

A special feature of the process is the regeneration of the washing solution by phase separation of the emulsion into hydrocarbons, an aqueous detergent solution, mechanical impurities and subsequent transfer:

- Hydrocarbons for use in technological purposes;
- Aqueous detergent solution in multiple cleaning cycle;
- Mechanical impurities for disposal or processing (using additional equipment of the Complex).

The main process of the technology is the separation of hydrocarbon compounds from surfaces using detergents that create a wedging effect and have a high demulsibility, which allows you to return to the turnover of up to 95% of oil and petroleum products.





### **COMPLEX FOR CLEANING OIL AND OIL PRODUCTS STORAGE TANKS**





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### **COMPLEX FOR CLEANING OIL AND OIL PRODUCTS STORAGE TANKS**

- 1. Mobile cleaning complexes MKO-1000.03 (container 40F DC)
- 2. Power supply and centrifugation module (MEC-100/25)
- 3. Mobile Steam-Heating installation (PPY 2000/100)
- 4. Additional equipment:
- MTM-PW tank-washing machine;
- Bottom Sediment Washing Device URDO-1;
- The device for a clean stripping of the tank UGIS-1;
- Diaphragm pump;
- Fan centrifugal FS;
- Hydraulic station;
- High pressure hoses;
- Hydraulic submersible pump;
- Pressure-suction sleeves MBS.













#### Scheme of technological process of the tank cleaning

#### Short description:

- Previously, liquid oil remains are pumped out.

For the washing devices installed on two manholes, the washing solution is supplied (t = 85-90 C, P = 10-12 bar).
Simultaneously, a water-oil emulsion with mechanical

inclusions (parts) is pumped out and sent to a centrifuge. - The emulsion, which is cleaned out from the mechanical impurities is pumped to MKO-1000 for separation into oil and washing solution.

- The washing solution enters a new washing cycle, the oil is transferred to the customer, and the mechanical impurities are sent for disposal.

- After removing the bulk of the bottom sediments, the washing solution is sent to a tank washing machine to wash the entire internal surface of the tank.

- At the final stage, the operator performs a cleaning of the screened areas in the tank.

- After that, the complete degassing and drying of the tank are carried out.

- Diesel generator provides power to the equipment of the complex.

- The steam generator supplies the coolant to the registers ] of the complex to maintain the required temperature of the cleaning solution.

- The equipment of the complex ensures the autonomy of its operation.



Steam Generator



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Mobile cleaning complexes MKO-1000 are intended for cleaning of inner surfaces of oil

and oil product tanks (reservoirs) by jet treatment with aqueous detergent solution and tank degassing.

The differences between modifications of the complexes by the fuel type are mainly explained by the main and additional equipment applied with them, the architecture of oil product/solution separation labyrinth. The difference in dimensions is explained by the capacity of pump equipment and performance of the complexes.

The main and additional equipment of the units is explosion-proof and certified.

Model	Purpose and characteristics
MKO-1000.02	For cleaning of light oil product storage tanks, the volume up to 10,000 m3 and filling stations (20F DC)
MKO-1000.03	For cleaning of dark oil product storage tanks, the volume up to 50,000 m3 (40F DC)
MKO-1000.04	For cleaning of light oil product storage tanks, the volume up to 50,000 m3 (40F DC)
MKO-1000.05 (HYD)	For inner cleaning of oil and gasoline railway tank cars (included into the Washing Station equipment) (40F HC)
MKO-1000.05 (OC)	For inner cleaning of railway tank cars and container tanks transporting organic chemistry products (included into the Washing Station equipment) (40F HC)
MKO-1000.05 (IC)	For inner cleaning of railway tank cars and container tanks transporting inorganic chemistry products (included into the Washing Station equipment) (40F HC)
MKO-1000.05 (OFP)	For inner cleaning of railway tank cars and container tanks transporting oil and fat products (included into the Washing Station equipment) (40F HC)
MKO-1000.05 (BG)	For inner cleaning of railway cars transporting bulk cargoes (included into the Washing Station equipment) (40F HC)
MKO-1000.06	For cleaning of aviation fuel product storage tanks, the volume up to 50,000 m3 (40F DC)
MKO-1000.07	For cleaning of oil and fat product storage tanks, the volume up to 50,000 m3 (40F DC)



### **MOBILE CLEANING COMPLEXES MKO-1000**

Designed for cleaning objects from hydrocarbon (oil) pollution. The equipment of the complexes provides feeding and pumping out of the Technical reagent TMS, washing of all surfaces of the tank with subsequent separation of the emulsion into TMS and oil (oil product), degassing of the tank.



## THE STAGES OF TANK CLEANING PROCESS WITH THE MKO COMPLEX

- Execution of work permits, holding of briefings
- Preparation of MKO to work;
- Establishment of the amount of non-withdrawable residue;
- Elimination of process residue of oil product
- Determination of the amount of paraffin and mechanical deposits

- Washing and cleaning of the tank inner surfaces;
- Preliminary degassing to the MPC normal values;
- Final cleaning of tank inner surfaces;
- Final degassing (drying) of the tank inner space, visual inspection and check

### **THE EQUIPMENT OF MKO-1000.03**





Multifunctional stationary and remote pump equipment for pumping petroleum products, TMS, feed and pumping technological solutions, emulsions and oil sludge.





### THE EQUIPMENT OF MKO-1000.03









### **MOBILE CLEANING COMPLEXES MKO-1000.03 (CONTAINER 40F DC)**







### **REFERENCE LIST FOR TANK CLEANING BY MKO-1000**

		Tank				Sludgo	
Country	Year	volume	Customer	Place	Oil type	m3	Service provider
		m3				1115	
Russia	2006	3 000	Samara-Terminal	Samara	Petrol	46	Pure World M LLC
Russia	2006	3 000	Oil Company RosNeft	Krasnodar	Crude oil	126	Pure World M LLC
Russia	2006	2 000	Oil Company TransNeft	Krasnodar	Crude oil	210	Pure World M LLC
Russia	2006	5 000 5 000 5 000 5 000	Oil Company SalavatNefte-OrgSyntez	Ufa	Crude oil	160 120 180 126	Pure World M LLC
Russia	2007	5 000 5 000	Moscow Refinery Plant	Moscow	Crude oil	240 310	Pure World Technology LLC
Russia	2007	5 000	Moscow Energy Company	Moscow	Crude oil	220	Pure World M LLC
Russia	2007	3 000	Voronej-Terminal	Voronej	Petrol	85	Pure World M LLC
Kazakhstan	2007	20 000	PertroKazakhstan	Chimkent	Crude oil	1 100	Pure World M LLC
Russia	2008	4 000	TverWagon Plant	Tver	Fuel oil	10	Pure World M
Russia	2008	20 000	Podolsk Nefteproduct	Moscow	Fuel oil	50	Pure World M
Russia	2008	5 000	Podolsk NefteProdukt	Podolsk	Petrol	150	Pure World M LLC
Russia	2008	10 000	Oil Company SlavNeft	Yaroslavlj	Crude oil	800	Pure World M LLC
Russia	2008	10 000 10 000 20 000	Oil Company RosNeft	Tuapse	Crude oil	160 170 270	Pure World M LLC
Russia	2008	3 000 3 000 3 000	Penza-Terminal	Penza	Petrol	30 28 52	Pure World M LLC
Sudan	2009	26 000	National Electricity Corporation	Khartoum	Crude oil	3 800	Pure World International
Russia	2009	30 000 10 000	Moscow Refinery Plant	Moscow	Gasoil Crude oil	840 350	Pure World M LLC
UAE	2010	65 000	Dubai Natural Gas	Dubai	Condensate	1 880	Pure World International, Dubai

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### **REFERENCE LIST FOR TANK CLEANING BY MKO-1000**

Country	Voor	Tank	Customor	Place	Oiltung	Sludge	Sorvico providor
Country	Tear	m3	Customer	Flace	On type	m3	Service provider
Russia	2011	5000	PodolskNefteProduct	Moscow	Gas Oil	40	Pure World
Russia	2011	200 x 42	Petrol stations ParkOil	Moscow	Petrol	400	Pure World
Russia	2011	50 000	Oil Company Rusneft	Tumen	Crude oil	1650	Pure World
Russia	2011	30 000	Voronej-Terminal	Voronej	Crude oil	480	Pure World
Panama	2012	7500	Electric Power Station	Colon	Crude oil	50	Technoecoprom, Panama
UAE	2012	30 x 5 units	Nalco Gulf Limited	Abu Dhabi, Musaffah	Heavy Nafta	min	Pure World International, Dubai
UAE	2012	3000 x 6 units	Samsung Engineering/Winteco Corporation	Abu Dhabi, Ruwais	Crude oil Ammonia	min	Pure World International, Dubai
Russia	2012	50 000 50 000	Oil Company Rusneft	Tumen	Crude oil	1800 2460	Pure World Zapadnay Sibyr
Byelorussia	2012	5 000 10 000	Oil Company BelNefteHim	Minsk	Petrol	40 90	Pure World M LLC
Russia	2013	20 000 20 000 20 000	Oil Company RosNeft	Tuapse	Crude oil	min	Pure World M LLC
Russia	2013	5 000 5 000 5 000 5 000	Oil Company SalavatNefte-OrgSyntez	Ufa	Crude oil	100 120 35 200	Pure World M LLC
Russia	2013	5 000 10 000	Moscow Energy Company	Moscow	Crude oil	120 320	Pure World M LLC
Russia	2013	30 000 30 000 20 000	Voronej-Terminal	Voronej	Crude oil	400 250 180	Pure World M LLC
Kazakhstan	2014	20 000 5 000 10 000 5 000	Mangistay Mynai Gas	Mangistay	Crude oil	1 100 500 700 320	Pure World SIC LLC

### **REFERENCE LIST FOR TANK CLEANING BY MKO-1000**

Country	Year	Tank volume m3	Customer	Place	Oil type	Sludge m3	Service provider
Kazakhstan	2015	20 000 20 000 10 000 20 000 10 000	Mangistay Mynai Gas	Mangistay	Crude oil	1 000 2 000 800 1 500 460	Pure World SIC LLC
Russia	2016	30 000 10 000 20 000 20 000 10 000	Moscow Refinery Plant	Moscow	Crude oil	1 120 300 580 640 600	Pure World M LLC
Russia	2016	2 000 5 000 5 000 10 000	Oil Company TransNeft	Krasnodar	Crude oil	110 200 220 410	Pure World M LLC
Russia	2016	5 000 5 000 5 000	Oil Company TransNeft	Krasnodar	Gas Oil	320 400 390	Pure World M LLC
Russia	2017	5 000 20 000 10 000	Moscow Refinery Plant	Moscow	Crude oil	470 190 900	Pure World M LLC
Kazakhstan	2017	10 000 5 000 5 000 5 000	Mangistay Mynai Gas	Mangistay	Crude oil	680 210 150 120	Pure World SIC LLC
Russia	2017	20 000	Podolsk Nefteproduct	Moscow	Fuel oil	min	Pure World M LLC
Russia	2017	10 000 10 000 10 000 20 000	Taman Nefte-Gas	Taman	Crude oil	180 290 500 2 100	Pure World M LLC

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### **MOBILE STEAM GENERATOR SET PPU-2000/100**

To heat the TMS solution to the operating temperature and to provide the thermal energy of the complex, a mobile steam generator set PPU 2000/100 is used, the heat carrier of the steam



### **TECHNICAL CHARACTERISTICS OF PPU**

Heated substance	water
Number of operating modes	2
Steam productivity, kg/h	2 000
Steam temperature, <sup>o</sup> C, not more than	310
Working pressure, MPa	0,6-9,8
Heating capacity calculated, kJ/h (kcal/h)	3 929 200 (940 000)
Rigidity of feed water, MKG - equiv/kg, not more than	10
Volume of water tank, m3	5,0
Volume of a fuel tank, liters	350
Fuel consumption by steam boiler, I/h	35
Safety valve	Sppkr 25-100
Used fuel	diesel
Fuel pressure, MPa, not more than	1,47
Time required to produce steam from the moment the boiler starts, min, not more than	10
Drive of all special equipment mechanisms	car engine
Installation Management	From the driver's cab
The noise level in the driver's cab during the operation of the unit, dB, no more than	80

### **OIL SLUDGE REFINERY COMPLEX**





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### **OIL SLUDGE REFINER COMPLEX**

- 1. Mobile cleaning complexes MKO-1000 (container 40F DC).
- 2. Modular boiler room (TGU-0,69 MW).
- 3. Power supply and centrifugation module (MEC-100/25).
- 4. Pontoon.
- 5. The formation water treatment complex.
- 6. Mobile and fixed installations for processing oil sludge.
- 7. The module of preparation of technical water.
- 8. Additional equipment:
  - screw conveyor;
  - belt conveyors;
  - fire monitor;
  - slurry pump;
  - bottom sediment erosion device URDO-1;
  - diaphragm pump;
  - pressure-suction sleeves MBS





















## The location scheme of the main and supporting equipment during the oil sludge processing



### **MODULAR BOILER ROOM (TGU-0,69 MW)**





#### **Purpose:**

#### It is designed to provide heat equipment for the oil slime complex KPN-1

Installation is a non-separable structure, assembled on a frame in the form of a 20-foot container, with all internal pipelines and is ready to be connected to consumers, which allows its connection to Mobile Cleaning Complex MKO-1000.

#### Principle of operation:

The use of diathermic oil as a coolant for the supply of thermal energy in various processes in the industry are preferable to steam heating, since it allows get high (up to 300 °C), coolant temperature at low pressures, which reduces the cost of the main consumer equipment and increases the safety of its operation. At low pressure, low viscosity and high thermal stability diathermic oil provides quick and easy control of the temperature of the process process, which is a prerequisite in many cases to ensure uniform heating of the product.





### **MODULAR BOILER ROOM (TGU-0,69 MW)**



### PONTOON

Pontoon with installed equipment for evacuation of water-oil emulsion from oil sludge ponds, with screen filter, heating registers, hydraulic pump and bottom sediment erosion device (URDO-1)





### ADDITIONAL EQUIPMENT OF OIL SLUDGE REFINERY COMPLEX



### Screw conveyor for feeding slurry from a centrifuge into a hopper shredder



- Technical specifications:
- Screw conveyor 6 m;
- Body type in the pipe (collapsible);
- The diameter of the feeder body is 219 mm;
- The diameter of the auger is 200 mm;
- The thickness of the screw turn is 4 mm;

#### **MOBILE AND FIXED INSTALLATIONS FOR PROCESSING OIL SLUDGE UZG-1M**

Processing and utilization of oil-contaminated soils and oily waste. Heat treatment of the sludge is carried out at temperatures from 500 to 800 C. The complex has a three-stage purification of waste gases. All units of the installation in the mobile version are mounted on the chassis of one or two trailers.

Resolution of Rostechnadzor of the Russian Federation No.PPC 00-25062 Certificate No. POCC RU.HO01.B00158 Patent RU 2341547



INSTALLATION FOR UTILIZATION OF OIL SLUDGE AND OIL-BEARING SOILS «UZG-1M»

It is designed for processing and utilization of oil-contaminated soils and oil-containing waste, incl. non-recyclable methods of washing, bio-processing or other methods, are economically less profitable. The unit provides utilization of heavily soiled soils with a pollution degree of more than 3%.

Waste is processed at a temperature of 500-900 ° C.

#### **MOBILE INSTALLATIONS UZG-1M**

The unit has a processing capacity of oiled soils from 6 to 8 tons per hour. For ease of operation, the control panel of the units is placed in a special booth, taken out at a distance of 6-10 meters from the thermal desorber.

The rotating drum is made of a high-strength steel pipe with a wall thickness of 10-15 mm, withstanding an internal radial pressure of not less than 50 kg / cm2.

The rotating parts of the installation have a fence.

Fuel burners have a system for protecting and blocking the burner to control the flame and limit values of the temperature parameters of the thermal desorber of the installation.

To ensure electrical safety in the installation scheme provides a "protective shutdown device" (YZO).

The afterburner is an additional unit of the UZG-1M line and designed to reduce the concentration of harmful emissions is due to the decomposition of residues of harmful components contained in the off-gas when the temperature is brought from 500-900 degrees C to 1050-1200 degrees Celsius.



### **MOBILE INSTALLATIONS UZG-1M**

The camera design uses the latest innovative technology.

Mobile installation on which the heat treatment of the sludge is carried out at temperatures from 500 to 800 °C. The unit has a three-stage purification of waste gases. All units are mounted on the chassis of a two-axle trailer "KAMAZ".

Based on long-term monitoring and operational experience of oil sludge processing plants, the enterprise has developed and since 2013 started the production of a new improved model of the UZG-1M.1.0 / 4 installation with a processing capacity of up to 3 tons per hour.

In this model, all the wishes of the users of the UZG-1M units are taken into account, in particular, it has the following features and advantages:

- the installation is placed in the body of the car, the transfer from transport to working position is performed in 60-90 minutes;
- an efficient five-stage exhaust gas purification system;
- built-in design of high-temperature afterburner chamber;
- the independent position of the two chemicals in the scrubber;
- improved shutter of rotary drum and adjustable speed of thermodesorber;
- convenience and without stopping the operation of the unit, cleaning of cyclones and flues;
- light and noise alarm of the fuel burner.





### MOBILE INSTALLATIONS UZG-1M.0,8 / 4.11 AND UZG-1M.0,8 / 4.1.7





#### Specifications

Model	UZG-1M.0.8 / 4.1.7
Productivity, with oiled soils from 3 to 16%, kg/h	2 000
Fuel consumption (diesel fuel, l/h)	до 20
Power consumption, kW	12
Dimensions in transport position, mm.	4500 x 2500 x 1800
Weight, kg.	5 000

#### Specifications

Model	UZG-1M.0.8 / 4.11
Productivity, with oiled soils from 3 to 16%, kg/h	2 000
Fuel consumption (diesel fuel, l/h)	до 20
Power consumption, kW	12
Dimensions in transport position, mm.	<mark>8720 x 2550 x 3800</mark>
Weight, kg.	8 500

### THE MODULE OF PREPARATION OF TECHNICAL WATER



The filter of preparation of technical water, (sorption) with automatic washing

Parameters of a string-membrane rough filter Aruan 40:	Value:
Water productivity	40 m³/h
Connecting dimensions	3 inches
Filtration fineness	50 micron
Dimensions	620x280



Parameters of a string- membrane rough filter Aruan 40:	Value:
Water productivity	25 m³/h
Connecting dimensions	2 inches
Weight	350 kg.
Presence of automatic washing	yes
Resource of refueling	10 years
Appointment	Purification from oil products, benzene, phenol, mazut, odor, heavy metals
Dimensions	2450x600x600x



#### **BIOLOGICAL PROCESSING OF CONTAMINATED SOIL**

Biological remediation of oily contaminated soil

Cultures of microorganisms at oil destruction process





A - Pseudomonas putida; E - Rhodococcus sp.; MK - Microbe cells; HK - Oil drop

### **BIOLOGICAL PROCESSING OF CONTAMINATED SOIL**

BIOLOGICAL REMEDIATION OF OILY CONTAMINATED SOIL (METHOD DESCRIPTION)

The method assumes refusal of universality in application of microorganisms at a remediation of lands and focuses a binding of preparations to specific conditions of the environment and qualities of oil more. This problem is solved as follows:

1. From the polluted surface remove a sample, and allocate from this sample microorganisms already living on this polluted soil. These microorganisms – "native" also are already adapted and for environment conditions, and for this quality of hydrocarbons.

2. The allocated cultures grow up separately in sterile conditions, mix and bring in the polluted soil. Such mechanism allows:

a) sharply to increase a caption, at the expense of higher degree of survival of microorganisms and their best adaptation to the native environment that attracts increase of speed of destruction of hydrocarbons;

b) to reduce volumes of introduction of microorganisms to this environment. For increase in growth rate of already brought cultures it is necessary to provide a number of low-cost measures that also has to stimulate work of microorganisms.

### WATER CLEANING COMPLEX







### WATER CLEANING COMPLEX

- 1. The formation water treatment complex.
- 2. Power supply and centrifugation module (MEC-100/25).
- 3. Industrial water preparation unit.
- 4. Block of preparation of drinking water.























## Scheme of the main and additional equipment for processing oily water



### THE FORMATION WATER TREATMENT COMPLEX

Pontoon with installed equipment for water intake with a strainer, a hydraulic pump and placed by the Scimers ASN-4 (oil product collector) Disk skimmer ASN-4 for collecting oil and oil products with water surface





### THE FORMATION WATER TREATMENT COMPLEX

#### Block No. 1 of preparation of technical water.

The coarse filter is made with a patented certified technology and is made of high-quality corrosionresistant alloys, which increases the service life.

The principle of the coarse water purification filter is the preliminary selective filtration of large and medium-fractional mechanical impurities in water or any other liquid. It is intended for preliminary

#### INCLUDES THE FOLLOWING EQUIPMENT, INSTALLED IN A 20-FOOT CONTAINER



filtration of water from unprotected surface water bodies. The fineness of filtration of the membrane of the filter is 50-100 microns (1/200 particle of a millimeter).

#### The main advantages of coarse filters:

1. Automatic drainage allows the filter system to be operated without maintenance in manual mode;

2. The filter elements depend little on the degree of contamination of the source water and have an almost unlimited resource - 20 years;



3. The application of the filter provides a fine mechanical cleaning - 50 microns, works without replaceable cartridges, easy to install and maintain.

4. The accumulations accumulated in the bulb are periodically washed off when the drain cock is opened. The pollution is discharged in manual or automatic mode.

**Fine filters** are filled with aluminosilicate polyfunctional adsorbent of increased strength. It is designed to remove a wide range of contaminants from the water: iron, strontium, aluminum, petroleum products, nitrates, chlorine compounds, hydrogen sulphide, ammonia and others.

**Filtration columns** for high-quality water purification are filled with sorption granules. As the operation is carried out, the sorption granules are periodically regenerated by common low-cost solutions. The maximum service life of one backfill can reach 15 years and depends on the concentration of harmful impurities in the treated water.

If the source water is contaminated with oil products at a level of 2.5-4%, the residual contamination of the obtained water will be approximately 0.0001 mg / l.

**The automatic flushing control unit** for the main filters will ensure the timely cleaning of the filter element and free from the need to monitor the condition of the drainage bend.

The filtration unit No. 1 consists of two identical lines, one of which is working, and the second one, in order to ensure uninterrupted operation of the unit during maintenance, makes it possible to prepare industrial water without mechanical impurities and with an oil content of not more than 0.0001 mg / l. in the volume up to 100 cubic meters per hour and use it when pumping into the formation to raise the pressure, and also to

feed to the filtration unit No. 2 for the preparation of drinking water.

### THE MODULE OF PREPARATION OF TECHNICAL WATER



#### The filter of preparation of technical water, (sorption) with automatic washing

Parameters of a string-membrane rough filter Aruan 40:	Value:
Water productivity	40 m³/h
Connecting dimensions	3 inches
Filtration fineness	50 micron
Dimensions	620x280



Parameters of a string- membrane rough filter Aruan 40:	Value:
Water productivity	25 m³/h
Connecting dimensions	2 inches
Weight	350 kg.
Presence of automatic washing	yes
Resource of refueling	10 years
Appointment	Purification from oil products, benzene, phenol, mazut, odor, heavy metals
Dimensions	2450x600x600x

### DRINKING WATER PREPARATION MODULE

TO PROVIDE PERSONNEL WORKING ON OBJECTS OF OIL PRODUCTION BY DRINKING WATER ADDITIONALLY SUGGESTED TO CONSIDER PURCHASE OF THE TECHNICAL WATER TREATMENT MODULE WATER TO THE DEGREES OF DRINKING, COMMON PERFORMANCE FROM 1 TO 25 M<sup>3</sup>/HOUR



#### Block No. 2 of drinking water preparation.

The module is a separate, non-volatile complex consisting of the following equipment located in a 20-foot container.

#### The new generation grafen sorbent

is carbon (graphite) subjected to radical destruction, as a result of which it acquires a fundamentally different internal structure and, accordingly, fundamentally new properties not inherent in other types of carbon.



Graphene sorbent in filtering devices allows water molecules, all natural salts and microelements and allows to purify water from microorganisms - bacteria and viruses. In graphene filters for the preparation of drinking water is used silvered graphene. Silver-plated graphene sorbent has a huge advantage in the effectiveness of protection against viruses and bacteria. Graphene sorbent is significant, and in some respects it absolutely surpasses all known in the world in the field of water purification. With a single filtration of drinking water, turbidity and the number of suspended particles decreases by 100 (and more), a high degree of metal removal, including heavy metals and radioactive ones, is achieved.

No filter in the world, except the HS, can turn marsh water into drinking water of the first (and often even higher!) Quality category, except in cases where there are poisonous impurities in the source water-true solutions of chemical production. Filters based on grafenic sorbent provide a fundamentally new level of water purification, in which water becomes not only crystal clear, but also acquires medicinal properties and unique properties: increases efficiency, promotes the processes of effective recovery of the body's energy after physical exertion, increases the body's immunity. This unit consists of two lines with a capacity of up to 50 cubic meters per hour, one of which is operational, and the second one, which ensures uninterrupted operation of the unit, in the event of maintenance, on one of the lines. The use of filters on the basis of grafenic sorbent (HS), in the preparation of water in oil fields, after its preliminary purification to the state of "technical" (0.0001 mg / I) at the first filtration unit, makes it possible to provide drinking water to the personnel of working settlements in the volume from 25 up to 50 cubic meters per hour, high quality and healthy people and exclude delivery of imported water.



### **DRINKING WATER PREPARATION MODULE**

Module of water treatment of technical water to the extent of drinking, with a total capacity of up to 25 m<sup>3</sup>/h



#### **DRINKING WATER PREPARATION MODULE**

Modular water treatment system for drinking water from 16 main filters "Hercules" with a total capacity of up to 25 m<sup>3</sup>/h



### **ADDITIONAL EQUIPMENT**



#### POWER SUPPLY AND CENTRIFUGATION MODULE (MEC-100/25)

Diesel-generator MVAE АД-100-400-P 100 kW for power supply basic and additional equipment

Centrifuge OGSh-501 with a capacity of 35 m3/h. for separation of mechanical impurities from pumped emulsion and oil products

### **ADDITIONAL EQUIPMENT**



### <u>MTM-PW tank-washing machine</u> <u>Technical specifications:</u>

ength:	211 mm
Width:	140 mm
Height:	293.5 mm
Norking pressure:	6.3 - 12 kg/cm2
Neight:	11.6 kg
Washing fluid flow rate:	10 - 38 m3/h
Rotation frequency:	2 - 4 rpm
Jet effective length:	12 - 17 m
Washing fluid temperature:	10 - 95 ∘C
Cycle duration:	10 - 20 min

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### **ADDITIONAL EQUIPMENT**

Diaphragm pump DM, productivity 565 l/min, for pumping viscous oil products Fan centrifugal FS-6000B for degassing of tanks





### **ADDITIONAL EQUIPMENT**

Hydraulic station HYCON for Hydraulic submersible pump Hydra-Tech High pressure hoses for hydraulic submersible pumps Hydra-Tech Hydra-Tech hydraulic submersible pump is designed for pumping all kinds of liquid with solid inclusions.



## **PRODUCTION AND SALE OF TECHNICAL DETERGENTS "VEGA-PW"**

#### Advantages:

- Emulsifying and deemulsifying properties ensure the work closed cycle;
- High washing capability;
- Multiple use;
- Environmental safety;
- All permissive documents are available.

# Multiple modifications for different types of contaminations















#### **PRODUCTION AND SALE OF TECHNICAL DETERGENTS "VEGA-PW"**

#### Technical cleaning agent "VEGA-CM-01"

TCA VEGA-CM-01 has several modification, that were specially designed for various types of pollution and surfaces, as it is obvious that cleaning of light oil products is different from Oil cleaning, and metal surface degreasing is different in essence from soil and ground cleaning from oil products. The goal of settling pond and slurry tank cleaning from old oil-slime is particularly difficult, as main slime ingredients are asphalt-sludgy-paraffin deposits that have high viscosity and value and melting point, thus, cleaning agent penetration into pollutant mass is difficult.

Using physical, chemical and technological research methods, we developed optimum TCA compositions and pollution cleaning methods providing environmental safety of processes. TCA is used in the form of water solution with working concentration 2-4 mass percents, does not contain alkali or phosphates, relates to 4<sup>th</sup> class of danger according to GOST FOCT 12.1.007-76.

Principal feature of TCA VEGA-CM-01 is composition balance, which provides good wetting and maximum emulsifying abilities of cleaning solutions. TCA VEGA-CM-01 compositions contain polyelectrolytes, that prevent resorption process, corrosion inhibitors and other additional substances.

Technological washing process, which runs in continuous mode, provides three-phase generation: upper oil product layer, water layer and bottom layer – washed soil and mechanical impurities.

#### Method of TCA "VEGA-CM-01" neutralization before discharge.

Optimal flocculant for TCA solutions is calcium chloride CaCL<sub>2</sub>. Neutralization results for 40 g of CaCL<sub>2</sub> per 1 kg of solution are given in table.

Pollutant	Pollutant concentration		
	Solution before neutralization	Solution after neutralization	Sediment
Suspended matters	2000 mg/l	432 mg/l	1568 mg/l
Chlorides	Absent	21600 mg/l	1420 mg/l
Sulphates	Absent	900 mg/l	Traces
Oil products	177 mg/l	5,0 mg/l	172 mg/l
Surfactants	1120 mg/l	38 mg/l	1082 mg/l
рН	10,85	7,2	

Thus, after neutralization solution can be discharged in sewerage system if it is approximately 2 times diluted with water. Main sediment content, besides soil particles (sand), is nontoxic calcium carbonate (chalk), which forms from soda and  $CaCL_2$  by reaction:  $Na_2CO_3 + CaCL_2 = 2 NaCL + CaCO_3$ 



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