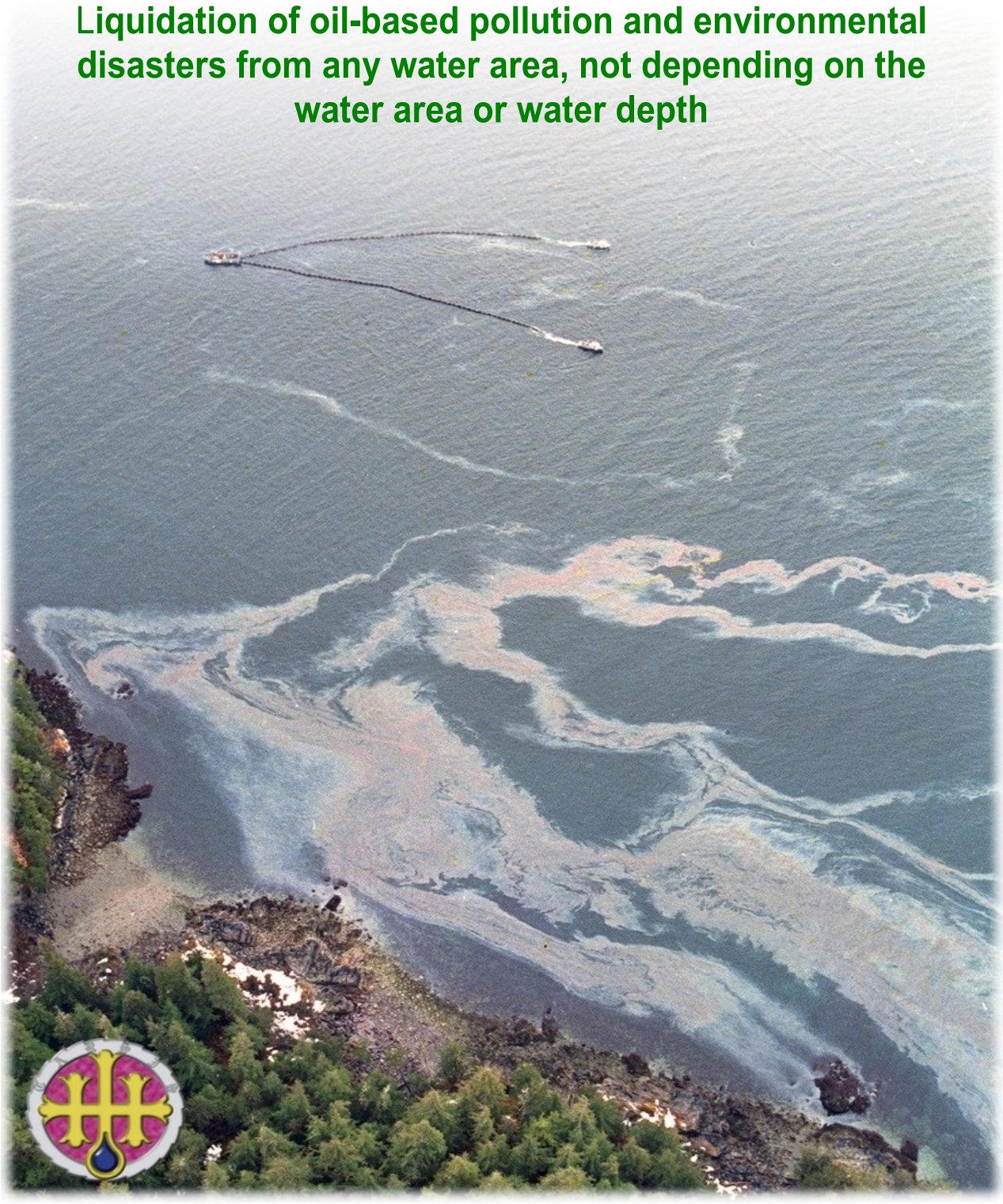
SHORT DESCRIPTION OF ECOVAC TECHNOLOGY

Liquidation of oil-based pollution and environmental disasters from any water area, not depending on the water area or water depth



ECOVAC Technology developed by owner and President of Company EUCO GROUP a.s. and BLACKSHAPE FINANCE HOUSE Ltd. is 100% environmental, 100% green technology. ECOVAC Technology works fully without any additional compounds and therefore it does not produce any waste. This fact is the main environmental contribution of the equipment.

Oil damage repair system by ECOVAC is based on a tortuous air flow over the polluted water level with floating suction nozzles copying the wavy water surface. ECOVAC does not use for oil pollution any movable fitment, for oil separation is not needed any direct movable element. All movable parts were replaced by especially directed variable tortuous air flow.

Info video on Youtube.com that gives additional information about this environmental solution: https://youtu.be/xvSMAlO5DqM and https://youtu.be/La5_Pn10CCg

MAJOR BENEFITS OF ECOVAC:

- Only a small quantity of water (about 1/20 of the oil mass) is skimmed together with spilled oil during the disaster disposal
- Recovered oil can be immediately used again, containing no new chemical compounds, with maximum 3 % of water!!!
- Small amount of water of industrial quality which contains from 1 to 35 mgs of crude oil compounds per liter is released back at/under the spill location.
- ECOVAC works independently, without the need of any support activities; ECOVAC needs no service background support.
- ECOVAC Technology does not use any chemicals, filters, absorbents, dispersants, and instruments; therefore does not produce any waste, such as oil soaked absorbents or contaminated water ferried from the spill location.

ECOVAC.2000 comprises six independently and concurrently working, remotely controlled 40 feet floating containers.

ECOVAC.2000 model´s floating containers can be transported to the place of accident by transport helicopters within a few hours. Such a quick response prevents the oil spill to move towards the coast.

ECOVAC.2000 works up to the wave height of 6 m and corresponding wind force, with water temperature as low as -2.5°C.

ECOVAC.2000 removes up to 2 000 000 liters of oil spill per hour, being operated by only 24 people, in addition to operators of tugboats and the tanker collecting crude oil pumped out by ECOVAC.

SHORT COMPARISONS:

Gulf of Mexico 2010

An explosion on the DEEPWATER HORIZON drilling rig in the Gulf of Mexico on 20th April 2010 caused a spill of 147 million liters of crude oil into the sea.
According to Willis Group Holdings and BP the bill for this disaster may exceed USD 90 billion.
30 000 people volunteered on the coast of Gulf of Mexico to collect crude oil, clean up the beaches and treat the affected animals.

Total oil spill removal with ECOVAC.2000 technology would take about 74 - 100 hours without the use of chemicals and with a 100% environmental system and no waste.
The costs of total oil spill removal by ECOVAC.2000 technology would not exceed the amount of USD 300 million.

Exxon Valdez DISASTER

More than 11 000 people, 1 400 ships and 85 airplanes worked for 3 years to eliminate the consequences of the disaster.

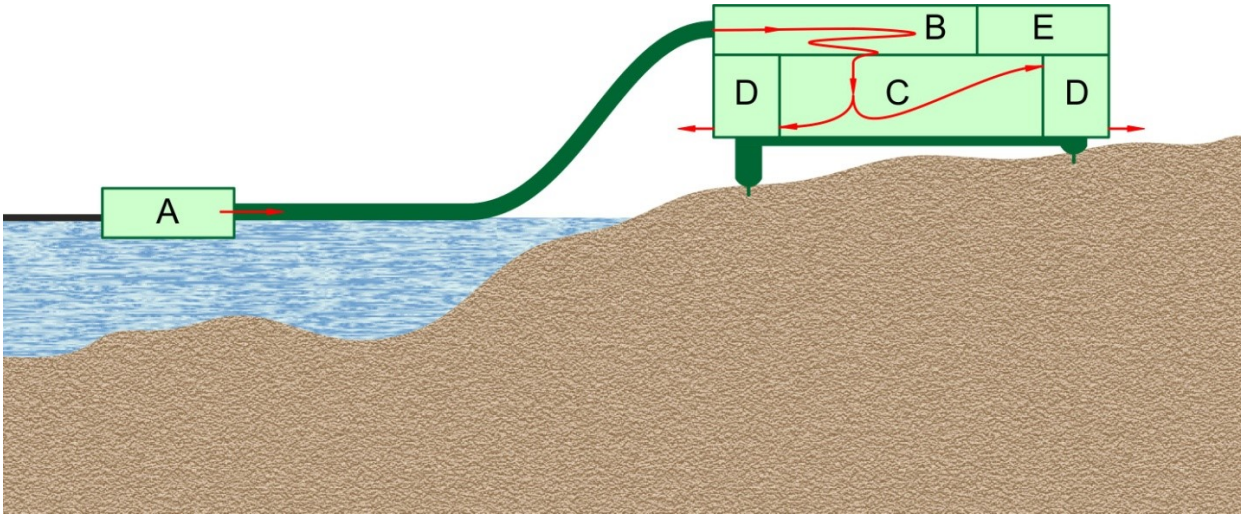
Less than 200 people would have to work on repair of damage with use of ECOVAC.2000 technology, for a few days only, with only six independently working and remotely controlled 40 feet floating containers, one tanker and two tugboats.

ECOVAC AS INNOVATIVE NEW MECHANICAL TECHNOLOGY FOR OIL CLEAN UP

Skimming is important parts of oil clean up and undisputed the most environmental sound form of oil collection. For the skimmer operation to be successful it must have high storage capacity, fast transfer of oil to and from temporary holding tank, easy to transport, have good maintenance, but conditions under which the skimming system is able to operate is also important. ECOVAC TECHNOLOGY has the capacity and ability to be extremely effective to collect the most, if not entire oil spill while in very fresh fluid state before it becomes sludge like mixture hampering the skimming process. ECOVAC TECHNOLOGY can be used in small and large oil spills on water surfaces (parking lots, industrial accidents,…), oil spills on the rivers, lakes or dams and in the oceans. Minimal depth of treated water is approx. 3 cm.

ECOVAC SYSTEM COMPONENTS AND ITS FUNCTIONS:

A (skimmer) is attached to the (F) transport hose which transports petroleum products from the water surface to the (C) separator where oil is separated from the water and discharged to (D) water and oil collecting tanks from where the clean water can be discharged back to the river or the sea and collected oil can be pumped into larger containers.



A. SKIMMER

- Collects layer of oil-based pollution from the contaminated area – mixes it with air and directs it to the connecting hose. The skimmer pulls only couple of molecules thick layer of water surface, and that water surface tension wafts oil-based pollution into the skimmer. Some small impurities does not harm skimmer´s oil collection
- Does not require any power source.
- Can be floating or manual version.
- Oil-based pollution and water are collected in mass ratio from 20:1 up to 8:1, i.e. much more oil-based pollution is collected than water.

• ENGINE ROOM

- Provides air to the collector and separates liquid from the air and it is driven by electrical system which can be adapted to any electrical voltage.
- Ecovac System comes in different sizes depends on the size of contaminated area but Ecovac 100 and 2000 are only autonomous versions and have its own combustion engine and fuel tank.

B. SEPARATOR:

- Multistage gravity separator which separates the oil from the water. Use of different separation systems is not excluded.
- Operates in horizontal position and has setting frame and sensors.
- The operation setting can be manual or automatic.
- Does not require any power source.

C. COLLECTING TANKS:

Each ECOVAC Unit has two collecting tanks, one for oil and one for water.

- Water tank is used to collect water if it is impossible to discharge clean water back to the water source and it allows the discharge of clean water into designated areas.
- Oil tank collects the oil after separation and without interruption of the cleaning process allows oil collected from contaminated are to be pumped into larger container.
- Tanks have pumps and sensors for the control unit.

D. CONTROL UNIT:

- Control unit manages and is responsible for the entire cleaning process, engine room and controls the discharge from collecting tanks based on the information collected from the sensors in the control unit.
- Its function is to transport the layer of contaminated water from the affected areas to the separator.
- Controls and responsible for separation of oil and water and dispose it into collecting tanks.
- The control unit can be either permanently connected to the engine room or by cable or wirelessly.

E. TRANSPORT HOSES:

- Transport hoses are floating on the water surface and can be up to one kilometer in length.

ECOVAC.2, ECOVAC.100 or ECOVAC.2000 Systems

There are numerous technologies for oil clean up after the spill into the oceans, rivers, lakes and dams but none of them are as efficient as ECOVAC systems.
ECOVAC System offers unique approach to oil clean up, is capable of cleaning up oil products spilled at the water surface in any thickness by siphoning the oil from the water surface, separates the oil from the water and collects the oil into oil tanks and discharges clean water to the water source, where remnants of the oil products are from 0,5 mg/liter to maximum 30 mg/liter – such contamination depends on material that has been skimmed.

The most important factor in every oil spill is the time, not the amount of oil spilled due to the fact that the volatile organic compounds partially evaporates and oil spill is loosing 20% to 40% of its mass very rapidly and becomes denser and more viscous. Part of the oil waste may sink with suspended particle matter and remainder eventually congeals into sticky tar ball once it reaches beach where the most ecological damage is done. The existing technology in larger oil spill is not capable to siphon more than 10% of the oil spill and with **ECOVAC technology the size of Exxon Valdez spill would be able to liquidate the spill in 3 days without any absorbents.**

ECOVAC TECHNOLOGY offers:

- Efficient way to clean up small and large oil spills with minimizing the ecological damage
- Is capable to siphon even one molecule oil thickness from the water surface which is not possible with the existing technology
- Is capable to function in large waves, up to 3 meters

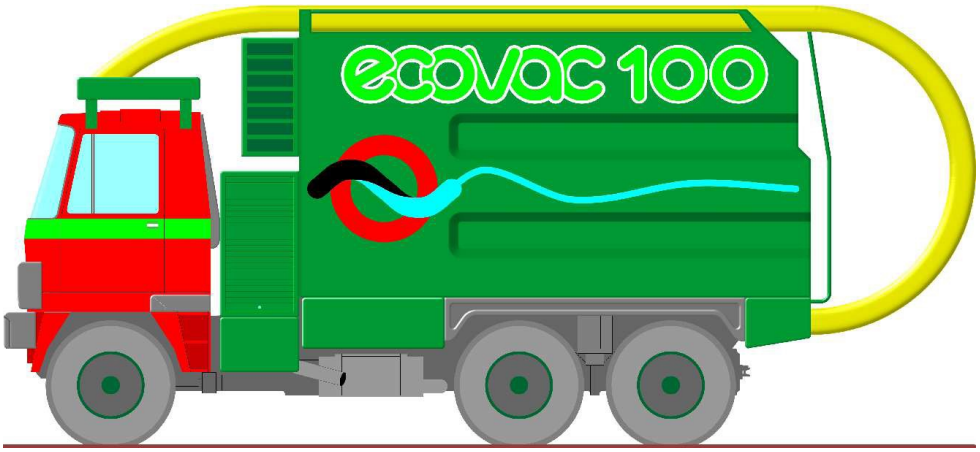
ECOVAC.2

Designed for small industrial spills in static, shallow waters or slow moving waters as in small lakes, streams or reservoirs. With ECOVAC.2 hand held skimmer (similar to vacuum cleaner) is used.

- The unit uses electricity with an alternative current of 230V and -12V – 24V
- Unit Size: Length: 1300 mm; Width: 700 mm; Height: 700 mm
- Unit Recover Capacity: 2,000 liters/hour (oil based products)
- Instalation Capacity: 0.55kW
- Intake Hose: 32 mm in diameter and maximum length 15 meters
- Output Hose: 25 mm in diameter and maximum length 20 meters
- Skimmer is in the river, collector is floating on the river near the shore, engine room with separator and collecting tanks are at the shore and after separation of oil from the water, oil is pumped into the oil tanker and clean water is discharged back into the river.

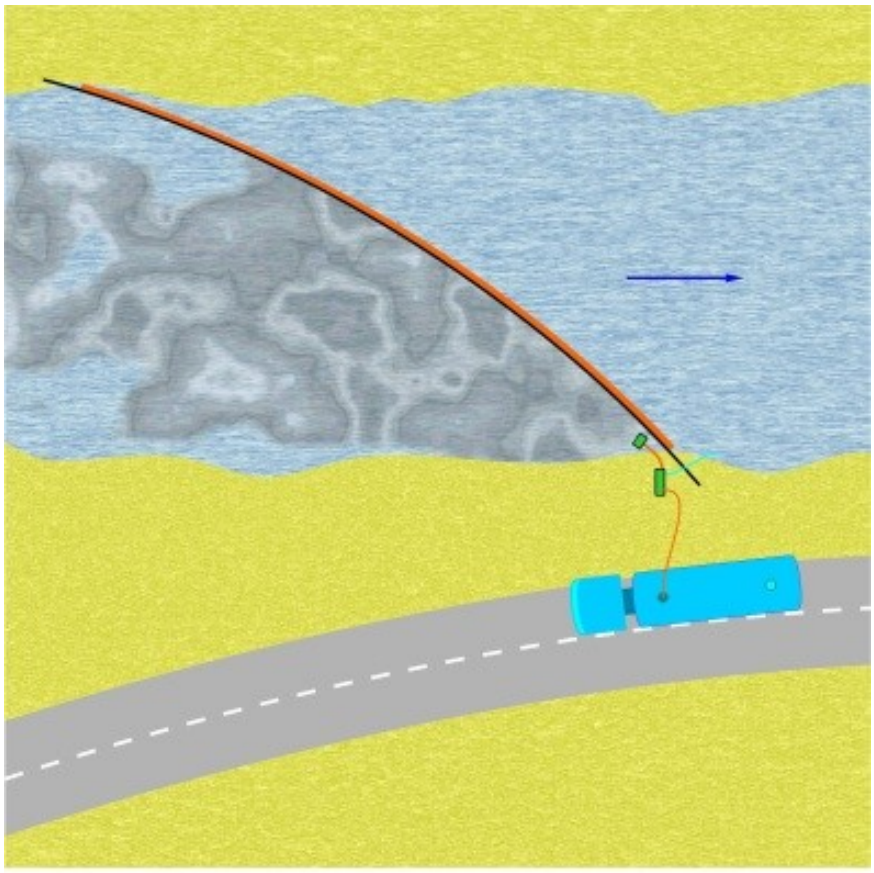
ECOVAC.100

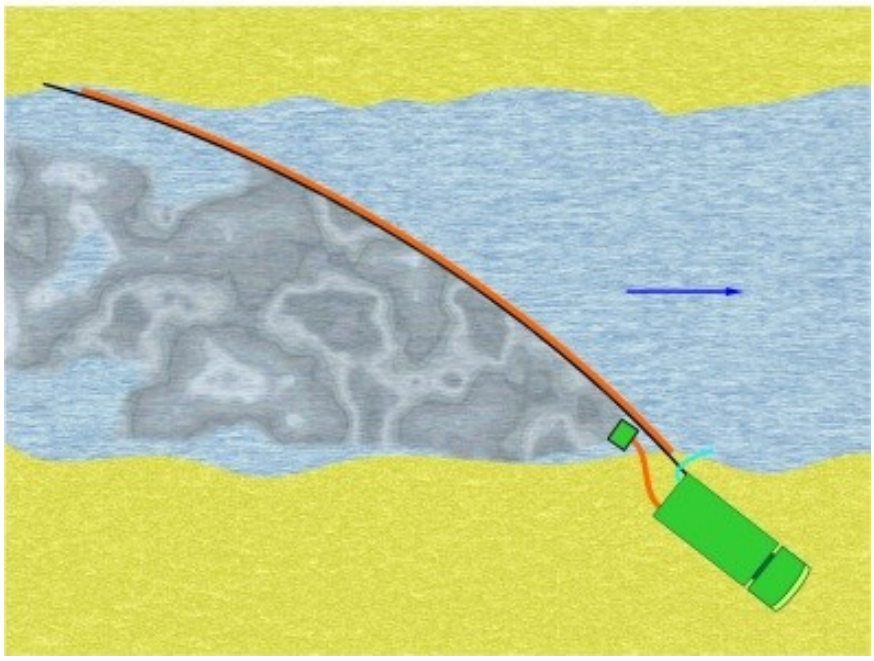
This unit is designed specifically for cleaning oil spills in the rivers, is self-sufficient and can be installed in wide range of vehicles (pick trucks, vans, tank trucks) or locations as long as the unit undercarriage is able to bear the weight of the unit at its maximum capacity (12 tons)



- ECOVAC.100 can use up to 4 multiple collectors
- Unit Recover Capacity: 100,000 liters/hour (oil based)
- Installation Capacity: 49kW diesel
- 2 Intake hoses: 200 mm in diameter and maximum 50 meters in length
- 2 Output hoses: 130 mm in diameter and 50 meters maximum length
- With ECOVAC.100 System up to 4 skimmers can be used and skimmers can be controlled by small boats or ropes from the shore and remote control with motorized skimmers is also available. Skimmers can be connected to each other directly or can be attached to the tank truck. The pumps, separator and collection tanks can be installed on the boat or can be station on the ground. To clean the banks of the river or lake pressure hoses and hand skimmers can be used. Clean water is discharged back to the river and recovered oil is collected by a tanker.
- See the drawings on following page

Oil slicks on the river are wall off with the boomer which is directing the oil slick to the bank of the river where the entire oil slick is collected by skimmer and transported to the separator and to the collecting tanks. This is not possible with the absorbent technique due to the fact that oil is compounded near the river bank and is able to get under the boomer and spread further to the river or river bank.



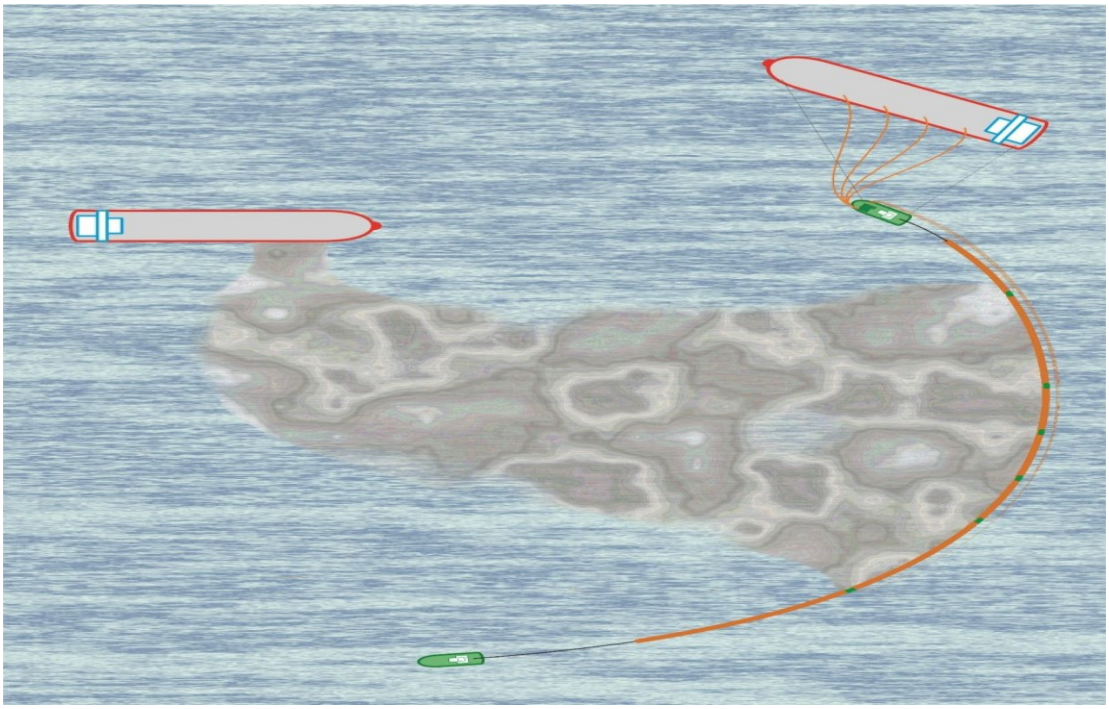


ECOVAC.2000

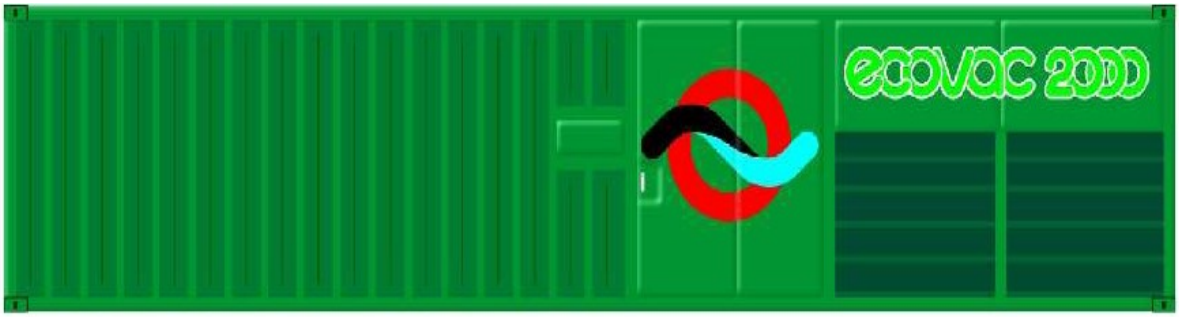
This is the largest of the **ECOVAC.2000** units and is designed for deployment in the sea in case of large oil spills and can be used in conditions up to wave level 5.
In the drawing below is a sample where two tugs are being deployed at the scene of an oil spill from a tanker. Two tugs are holding the immersion walls to contain the oil spill. The main tug is bound in a safe distance to the replacement tanker and from the ECOVAC.2000 collectors the oil harvested from the spill in the collector tank is transported to the replacement tanker. In the case of calm sea the tug and replacement tanker cam be anchored. Tugs keep emersion wall downwind of the pollution source. A rescue tug from any ship close to the accident can be used to house ECOVAC.2000 and can be transported easily by a military helicopter or by another ship.

ECOVAC.2000 main unit can consist up to 13 containers and each container has:

- Engine room – ISO 1AA –diesel pumps
- One fueling tank – ISO 1C – 20,000 liter capacity
- Five Separators – ISO 1AA
- Six intake floats – ISO 1C
- Cleaning Capacity: 2000 m3/hour
- Installation capacity: 1050 kW diesel generator
- Intake tubes: 500 mm in diameter and maximum length of 1000 meters
- Output tubes: 250 mm in diameter and maximum length of 1000 meters



- Floating collectors are on the water surface and are connected together with immerse wall in total length up to 1200 meters.
- Transportation hoses from the collectors to the main tug are along the immerse walls.
- Engine room, separator and collecting tanks are on the main tug.
- Treated water is discharged back to the sea.
- Collected oil from the collecting tanks is pumped into the ship tanks or another oil tanker.
- ECOVAC.2000 uses specially designed collecting tanks and can be loaded to a designated ship or any other ship used in emergency clean up.



- Depends on the size of oil spill ECOVAC System can contain up to 13 independently working units.

COMPARISON OF ECOVAC TECHNOLOGY TO OTHER COMMON TECHNOLOGIES

ECOVAC TECHNOLOGY		OTHER COMMON TECHNOLOGIES	
1.	**TIME OF REACTION:** ECOVAC remote-controlled standard 40´ large floating containers could be delivered to the place of disaster even by planes or military helicopters within couple of hours. Within 30 min. after ECOVAC containers where put on water surface, they start cleaning of sea/lake surface. There is needed only one vessel to load collected re-usable crude/fuel oil into collecting bin/tank.	**1.**	**TIME OF REACTION:** all other standard technologies are transported to the place of disaster by ship and that takes much more time as by ECOVAC. After arriving to the place of disaster, those vessels need even more hours of preparation to start the oil spills clean-up.
2.	**TIME DELAY CAUSING ECOLOGICAL AND FINANCIAL LOSS:** After couple of hours/days part of any crude oil spill slowly sinking deeper under the water surface in the form of tar balls; evaporation of light oil components causes inspissation of the spill. Fast response using ECOVAC avoid this problem.	**2.**	**TIME DELAY CAUSING ECOLOGICAL AND FINANCIAL LOSS:** After couple of hours/days part of any crude oil spill slowly sinking deeper under the water surface in the form of tar balls; evaporating of light oil components causes inspissation of the spill. Standard cleaning technologies – because of their slow response – cannot avoid this problem.
3.	**DISPOSAL PERFORMANCE AS PROFITABILITY AND ENVIRONMENTAL FACTOR:** ECOVAC is the most effective technology ever, because it has the highest ration of disposed oil quantity / worker; as well as the highest ration of disposed oil quantity / power drain. • Set of six 40´ size remote-controlled floating containers equipped by ECOVAC Technology could clean-up 2´000´000 liters of oil pollution hourly. • One remote-controlled floating container with oil disposal capacity of 330,000 ltr. / hour needs only one operator and 3-4 semi-skilled workers (to handle/control one hose-pipe for oil pollution loading, and to fix/control floating barrages).	**3.**	**DISPOSAL PERFORMANCE AS PROFITABILITY AND ENVIRONMENTAL FACTOR:** no one standardly used common disposal technology has even fraction of disposal performance by the same costs / energy consumption / manpower needs. All common technologies for oil spills´ disposal need • much more workers and logistic back staff as ECOVAC for the same disposal capacity, • higher-order quantity of energy consumption as ECOVAC for the same disposal capacity, • more additional vessels for transportation of polluted water or hazardous waste from polluted area to the coast deposit (port),

	• One remote-controlled floating container with oil disposal capacity of 330,000 ltr. / hour needs max. 100 ltr. of diesel fuel / working hour. • ECOVAC does not have costs for transportation of polluted water or hazardous waste from polluted area to the coast deposit (port). • ECOVAC does not need any additional vessel for transportation of any chemicals or any other adjuvants or filters.		• additional vessels for transportation of chemicals, adjuvants, filters, sorbents, dispersants, etc…
4.	**DEPENDENCE ON WEATHER CONDITIONS:** ECOVAC could collect the oil pollution from the water surface up to 6 m high waves. Windy weather does not hamper too much the oil spill treatment. ECOVAC works even at – 2,5 °C cold water	**4.**	**DEPENDENCE ON WEATHER CONDITIONS:** Water waves, too cold water or windy weather mostly disable most of standard oil spill treatment techniques.
5.	**DISPOSAL EFFICIENCY:** • Because of mobility, short reaction time and high disposal performance of ECOVAC Technology, ECOVAC could clean-up over 95% of crude oil of common oil spill, • Collected oil-based pollution is separated in automatic mode of operation in purity that contains only approx. 1 – 2 % of residue water – nothing else, no chemicals. Therefore is always re-usable at petrochemical industry. It could be transported by common bulk tanker vessels. • There are no movable components/fitments used. All such elements we "replaced" by agitated air (excepts some pumps and vacuum fan, as unified auxiliary components) • No chemistry is used. • No residue remains after pollution disposal. • Water is separated in automatic mode of operation up to water purity containing approx. 3 – 50 mg/ltr. of residue oil (it depends on the sort of oil-product that is floating on water surface). Cleaned-up water after automatic separation done	**5.**	**DISPOSAL EFFICIENCY:** Recently used common technologies for oil spills´ disposal clean-up about 30-40% of oil pollution. Collected oils (and usually even the water) are nearly always unusable hazardous waste material, because of subsequent reaction with sorbents, dispersants, of bacteria – such oils have to be treated as hazardous material. No one common technology (except low performance skimming) can collect only couple of molecules thin layer of oil pollution.

	by ECOVAC is discharged back (in process water purity) to the sea/lake under the front of oil spill, therefore is always re-used and more times cleaned. • ECOVAC could pull down even couple of molecules thick pollution film from the water surface, even if the sea/lake is undulating, as well as ECOVAC could collect oil spill in more tens cm thick layers. • The technology is 100% eco-friendly, no residue, no pollution. • Costs of ECOVAC manufacturing, as well as pollution disposal operation is much cheaper than other technologies offered on the market. The price is only a small fraction of operating costs of other common technologies.		**DISPOSAL EFFICIENCY:** Recently used common technologies for oil spills´ disposal clean-up about 30-40% of oil pollution. Collected oils (and usually even the water) are nearly always unusable hazardous waste material, because of subsequent reaction with sorbents, dispersants, of bacteria – such oils have to be treated as hazardous material. No one common technology (except low performance skimming) can collect only couple of molecules thin layer of oil pollution.

Inventor suggests using booms. One of the largest EU boom manufacturer Company Svitap from Czech Republic www.svitap.co.uk is ready to manufacture for our ECOVAC Technology implementation 250 m long booms with 100 cm body diameter and 200 cm deep membrane wall. They informed us that such boom will put back waves with oil pollution even 150 cm high.

What happens if no tank boat is available immediately from the beginning of oil spill collection; where to put the collected crude oil until some tanker will arrive? Czech company Gumotex www.gumotex.com/products is ready to manufacture for our ECOVAC Technology implementation floating flexible flat inflatable tanks made from stormproof rubber-textile, as temporal storage tanks for collected oil pollution. Such flexible tanks will have storage capacity for more hours of ECOVAC work.

Description of the patent for the utility model of ECOVAC Technology is available in following link at the Slovak Patent Database: http://skpatents.com/14-u6628-zariadenie-na-zber-a-sposob-zberu-znecistujucich-latok-plavajucich-na-hladine-vody.html

ECONOMIC ADVANTAGES
FROM PRODUCTION, SALE AND UTILIZATION OF ECOVAC TECHNOLOGY.

We are looking for one global partner or investor into ECOVAC Technology solution. ECOVAC has three modifications ECOVAC.2000 , ECOVAC.100 and ECOVAC.2. Utilization of ECOVAC has more aspects, as is it described hereinafter:

1. One complete set of the Technology enough for large oil spills´ disposal consists from 6 pcs. of 40´´ ECOVAC.2000 containers. To set up a World-wide network covering the whole globe as standby facility preventing large damages caused by crude oil disasters are enough to have ECOVAC.2000 Technology sets at 18 points all over the Globe, i.e. 108 pcs. of ECOVAC.2000. If sale price of one 40´´ container ECOVAC.2000 Technology will be set for 3´600´000 EUR, the profit for producer could be over 2´600´000 EUR / container, i.e. about 280 million EUR as net profit for the producer.

2. If the Global partner, the investor into the ECOVAC Technology will reach an agreement with large insurance companies (Allianz, Lloyd´s,…) about supply of ECOVAC Container to each big cargo ship or tanker, and/or any deep sea oil rig, the number of sold containers could increase over a thousand pcs. In that situation, the profit for producer could be over 3´000´000´000 EUR as net profit for the producer/seller.

3. If the Global partner, the investor into the ECOVAC Technology will use the Technology by an oil spill disaster treatment, than its revenue could increase for additional hundreds of millions EUR or more.

4. If the Global partner, the investor into the ECOVAC Technology will manufacture and sale ECOVAC.100 and ECOVAC.2, than could get revenue over additional 900´000´000 EUR or more. Net profit from production is over 120% by each ECOVAC product.

ECOVAC Technology´s world-wide patent protection rights have an expert evaluation done by an official institute doing expert opinions for courts and state offices in Slovakia and European Union. The expert evaluation is made in the value of 285´000´000 € by the Research Institute for evaluation of a management of Companies and for Forensic Engineering, Inc. www.vurhp.sk.

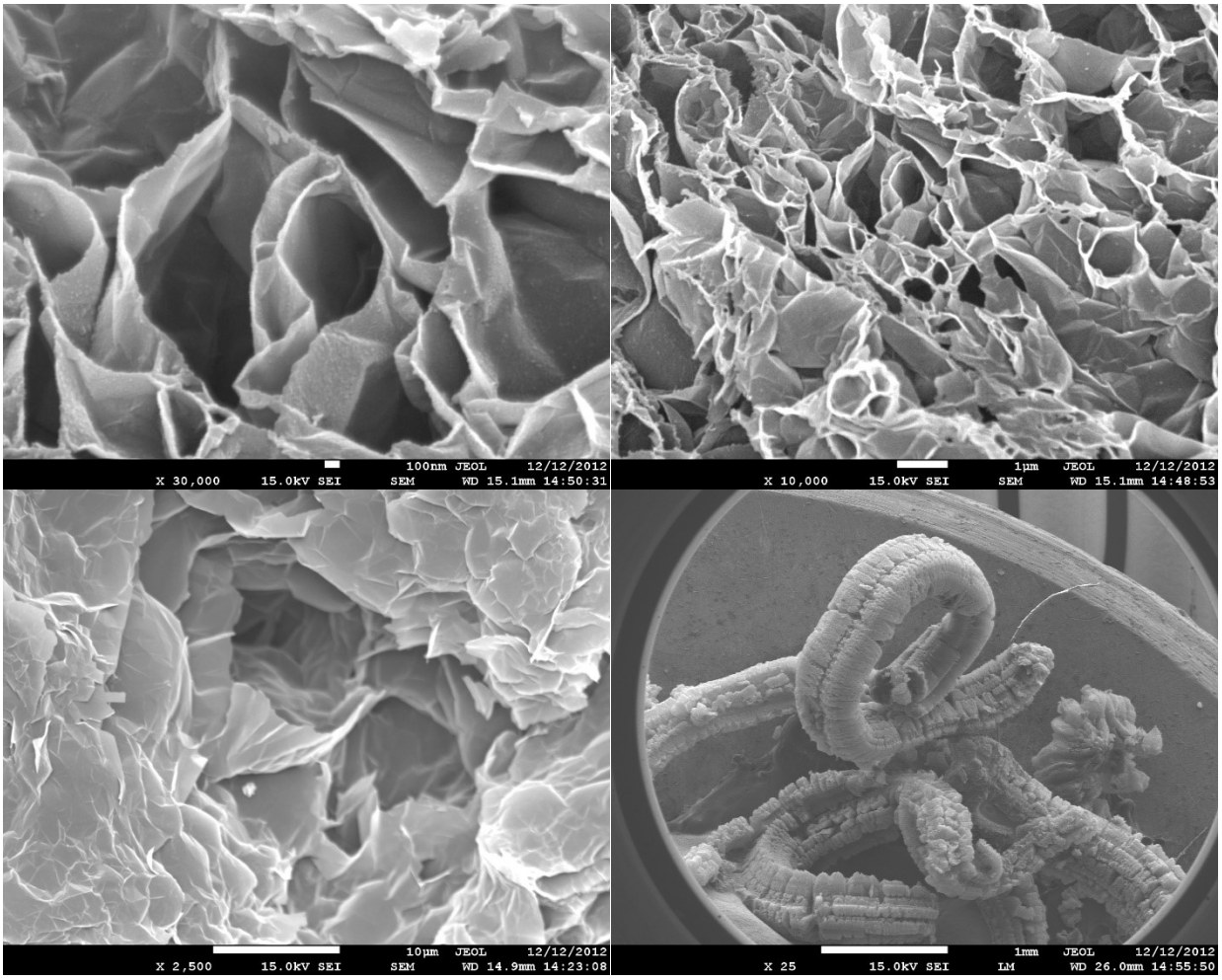
Manufacturing of any ECOVAC unit is very simple, it is only assembling work of unified components; it does not need any special machinery of other facility.

As a supplemental solution to ECOVAC Technology could be offered a production and usage of graphene sorbent produced by Partner Company of BLACKSHAPE FINANCE HOUSE LIMITED. The sorbent could be easily produced anywhere using simple production line installed in standard ISO container.

THE SORBENT

Short material description

The material is very light and porous/cellular with density of 6-7 kg*m^{-3} in bulk – the structure of it show photos made by electron microscope:



There is possibility pelleting the sorbent into small granules (from 1 to 5 mm) that will after contact with the water pulverize and so increase its absorption capacity. Because the sorbent is very light, it is floating on water surface. After the pollution from the water surface, the sorbent could be separated from the water colandering the water surface film.

We are able producing the sorbent granules for less as 10 USD / kg.

Economic advantages: One kg of sorbent collects over 30 kg of reusable crude oil from the water surface. 30 kg of crude oil costs approx. 20 USD, i.e. you could get back 20 USD with 13 USD costs = gain of 7 USD. In addition the sorbent is reusable (even with lower absorption capacity) again. Calculation with more expensive fuel oils or Gasoline shows higher financial advantage.

If you use sorbents from other producers, the crude oil pollution is lost and the sorbent is not reusable.

Because the material is inert and very heat-stable, any petrochemical or other liquid/gas pollution absorbed by it could be distilled off from the sorbent, so the sorbent could be recycled and reused more times for the same purpose.

The material is absolutely Carbon based, therefore is not health-hazard; any ingurgitation in normal quantity is not hazardous. Because of Carbon based nature of the sorbent, any absorbed oil/fuel could be burned as classical heating fuel without extra pollution, i.e. collected oil pollution could be used as energy holder, fuel.

Collected crude oil or any oil based pollution could be pressed/extracted from the sorbent and reused for its former purpose. After the sorbent was pressed than its adsorption capacity decreases to approx. 60% of its former capacity; but if the rest of oil will be distilled off from the sorbent and the sorbent regenerated by microwaves, its absorption capacity will be back close to its former absorption capacity.

The sorbent is very thermo-stable up to 650°C, with low heap-carrying capacity, but with high electric conductivity. The sorbent does not burn nor ignite up to 650°C.

At 1200°C burns in atmosphere with combustion heat of 30,48 MJ.
Because, the sorbent is very light material it is easy to separate it from most of other materials, i.e. earth, sand, metallic or nonmetallic materials, etc.

Absorption properties of the sorbent in bulk state:

Absorbed Material	Adsorption Ratio **m** of sorbent / **m** of selected material
Gasoline 95	1 : 32
Petroleum	1 : 42
Engine Oil	1 : 74
Sunflower Oil	1 : 68
Crude Oil (from the Gulf)	1 : 53
Hydraulic Oil NH 46	1 : 95
Hydrogen Nitrate	1 : 45
H_2PO_4	1 : 95
Various gasses	from 1:35 up to 1:90

Absorption capacity of the sorbent is demonstrated in short video – that is downloadable from following links: https://youtu.be/h-wyFB4Mn_A and https://youtu.be/vmyGlepr0WI

If the sorbent is pressed in its 50% of bulk volume, adsorption properties decrease about to 60%-65% of former in bulk capacity and adsorption time is prolonged about 1,5 to 3 times. It means we could spare about 50% of working space, but with longer and lower adsorption properties.

Production line of the material is possible to be installed even in standard shipping container, therefore is not necessary to carry the sorbent to the place of use (fare territories or sea).

Mgr. Boris SVASTA
President of BLACKSHAPE FINANCE HOUSE LTD.