ARKOIL Technologies

Oil service provider

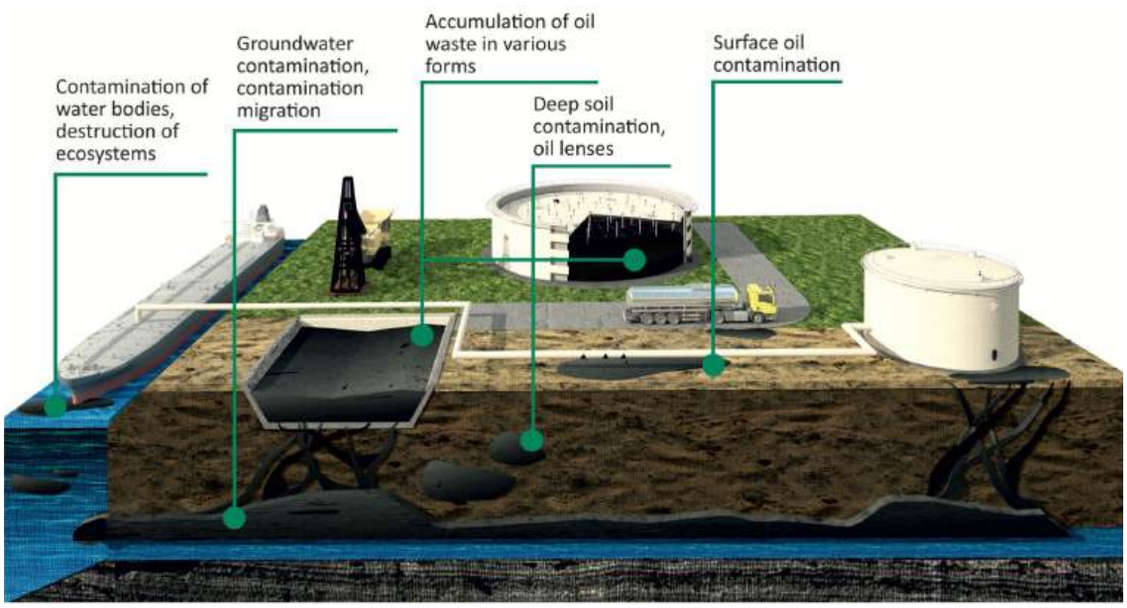
Environmental and tank cleaning solutions

Eco-friendly Time-efficient Cost-effective

Who we are

Arkoil Technologies is a well-established Dutch-formed oil service provider which gathered talented oil industry specialists intending to cater to the Clients' most ambitious needs and requirements.

Solving environmental problems for the oil industry



Environmental solutions

Over
- **520 000 m³**
  of oil sludge
  recycled using closed-cycle technology

Over
- **800 000 m³**
  of oil sludge
  treated using microbiological method

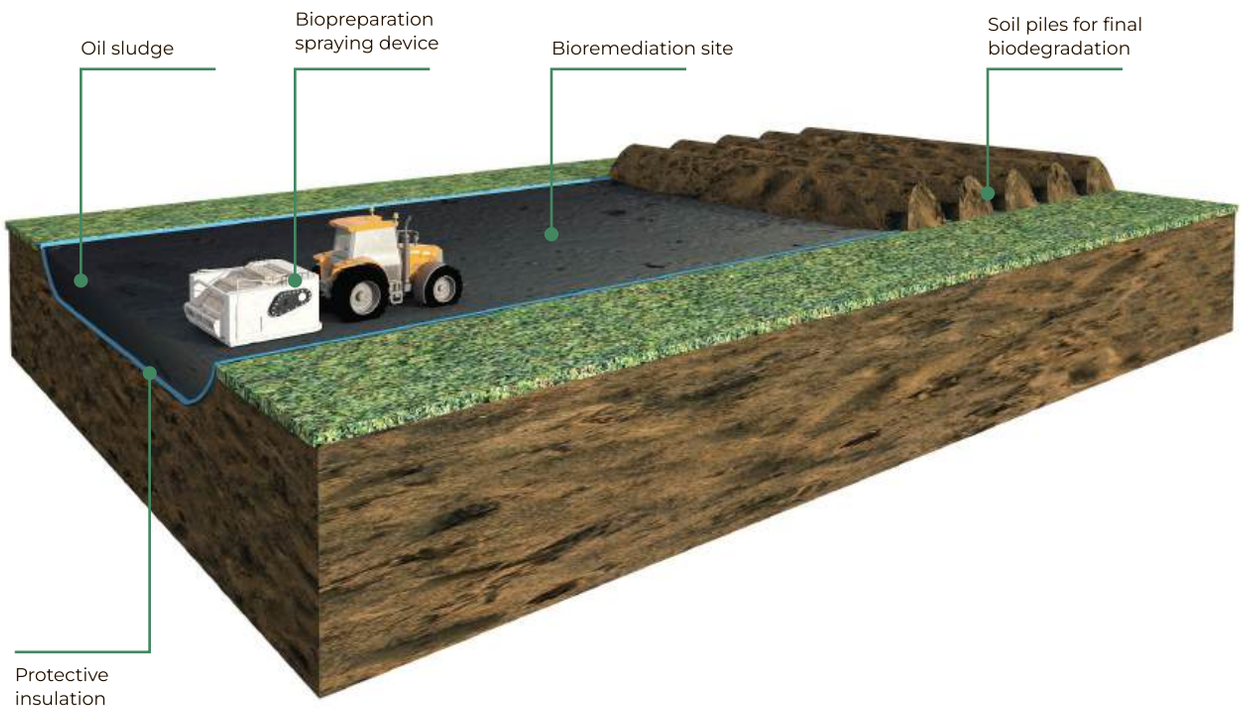
Over
- **3 400 000 m³**
  of oil-contaminated soil
  cleaned without excavation

Over
- **80 000 tons**
  of oil-containing fluid
  recovered and returned to the Client

Non man entry tank cleaning and oil recovery

- Over **400** crude oil tanks
- Over **20** damaged tanks

MICROBIOLOGICAL REMEDIATION



Technology is used for treatment of:

- Oil sludge
- Oil-contaminated soil

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Treatment can be performed:

- In situ (without excavation)
- Ex situ (with excavation)

Safety

- Microbiological remediation results in safe soil and water
- The highest level of environmental safety standards are followed
- No emissions to the atmosphere

Profit

- 99 % of hydrocarbon can be eliminated
- Possibility of oil recovery
- The produced soil can be safely used within Client's territory
- No wastes to dispose

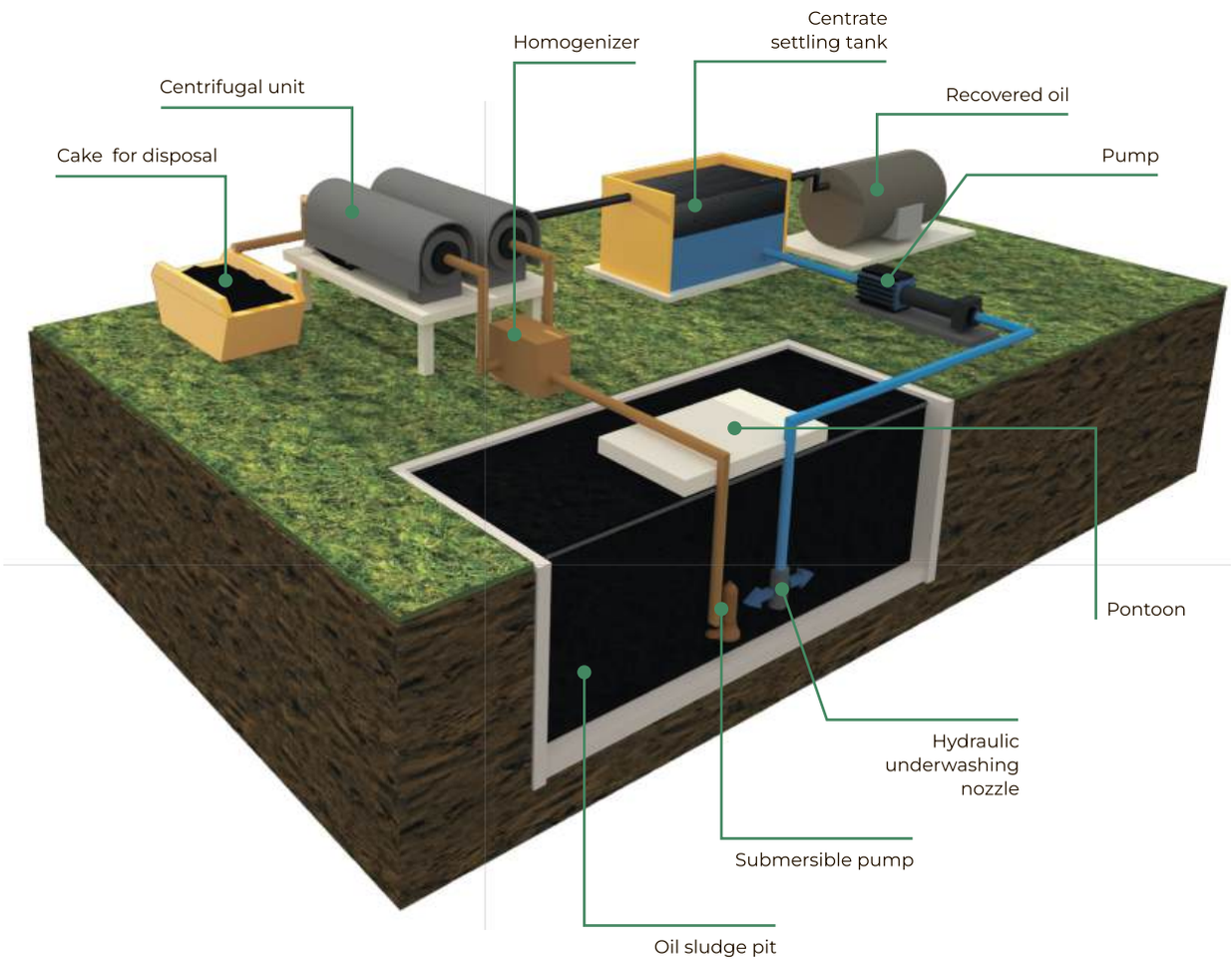
Flexibility

- Arkoil produces its own biopreparation and can isolate indigenous strains from the local environment
- Applicable to various types of oil-contaminated sludges, including sludges with high level of hydrocarbons content
- In situ and ex situ wastes processing
- Mobility of the technology
- No weather or seasonal restrictions

Time

- While dealing with large volumes of sludge, treatment can be carried out faster than by thermal methods

OIL SLUDGE TREATMENT



Methods of sludge extraction and pre-treatment:

- Hydraulic underwashing inside the pit
- Excavation and hydraulic washing in portable homogenizer

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Safety

- No negative impact on the environment
- The technology compliance with the highest environmental standards

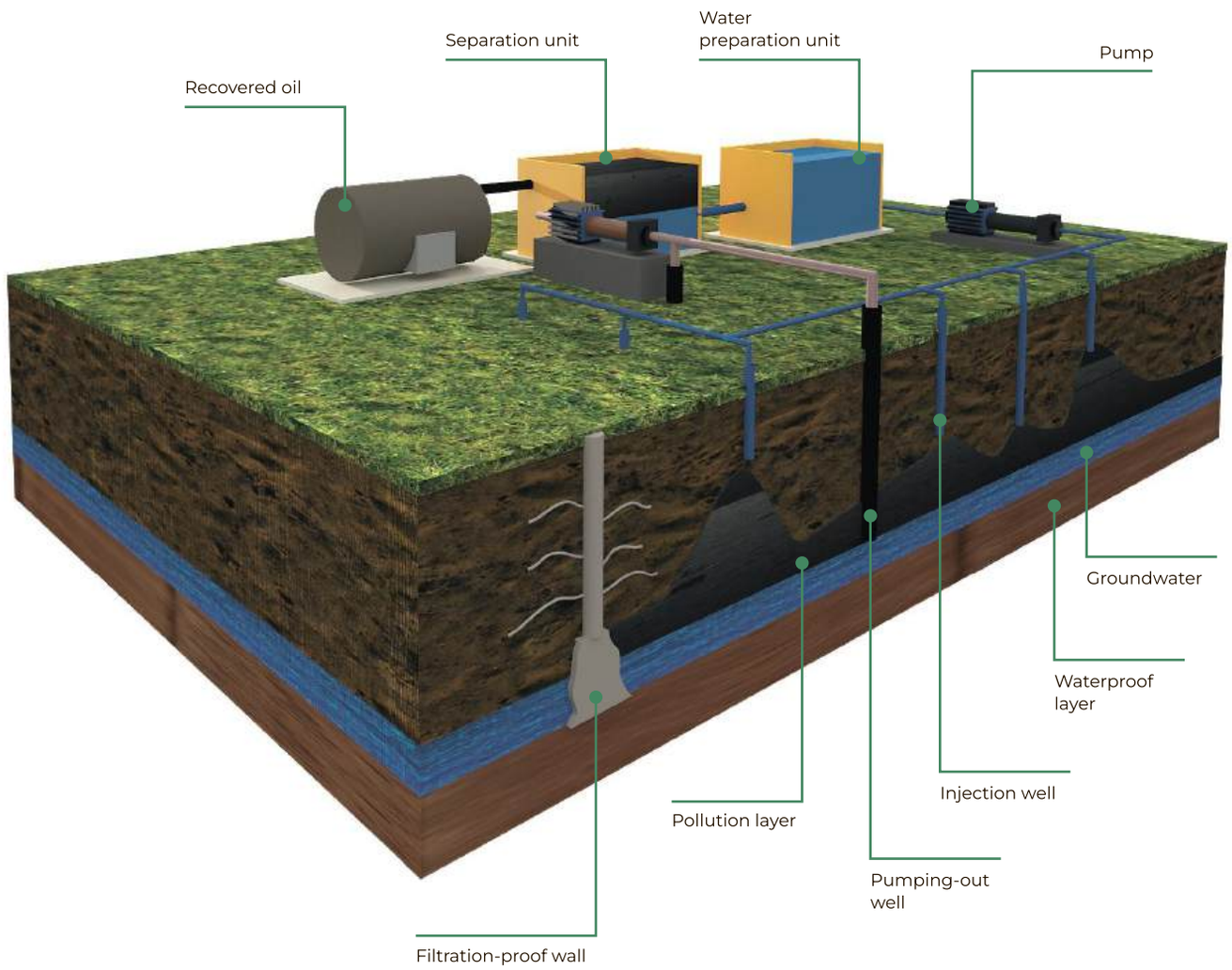
Profit

- Oil recovery
- Water is recycled
- Significant reducing of volume of waste for disposal

Flexibility

- Customized solutions
- No weather or seasonal restrictions
- High speed and efficiency of the work performed due to the technology mobility

SOIL AND GROUNDWATER CLEANING



Technology is used for:

- Cleaning of contaminated groundwater
- Cleaning of deep soil contaminations from 0.5 m up to 70 m without excavation
- LNAPL extracrion

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Safety

- Prevention of hydrocarbons contaminated groundwater migration
- No risk of contaminants penetration outside the contaminated area during work performance
- Oil-contaminated soil and groundwater cleaning is performed with no damage to the ground
- No negative impact on the environment
- The technology compliance with the highest environmental standards

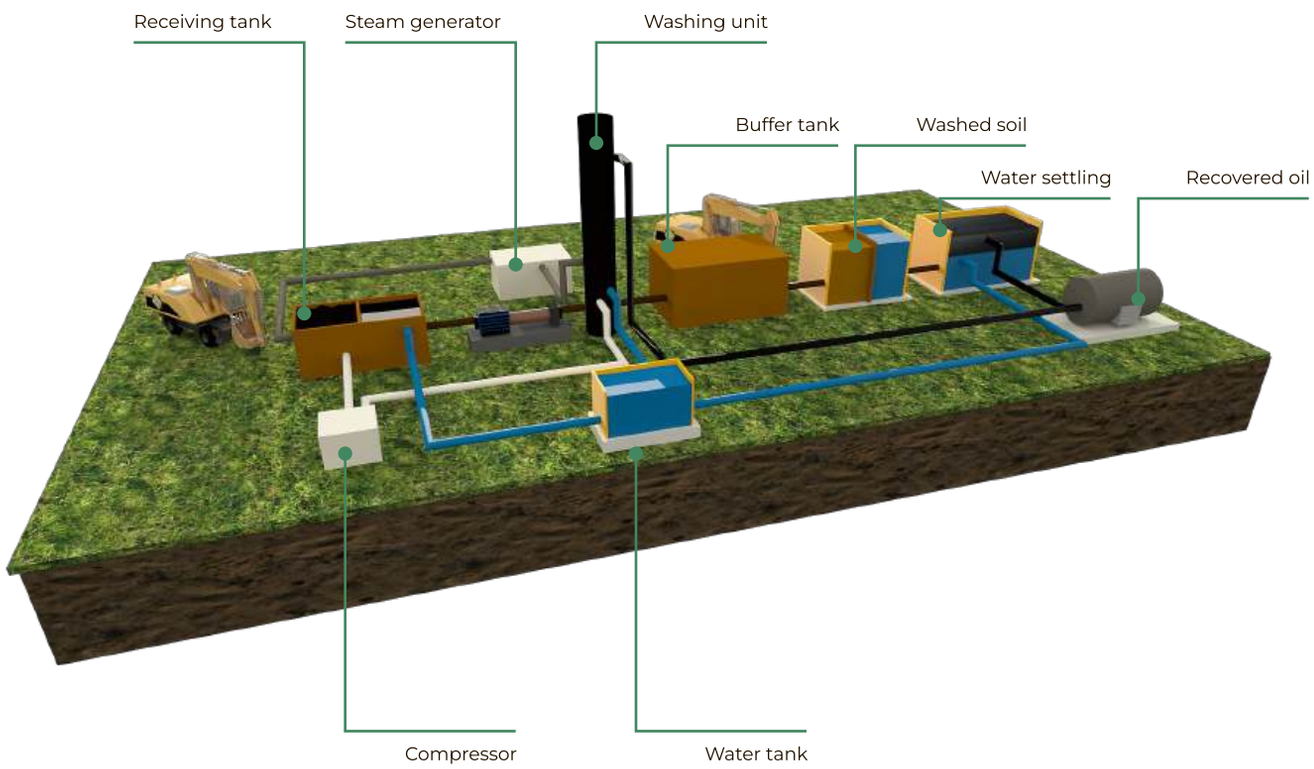
Profit

- Oil recovery
- No need to remove underground utilities before cleaning

Flexibility

- Method is applicable to any type of pollution including toxic one
- The construction of the filtration-proof walls is executed without excavation at a depth up to 70 meters

EX-SITU SOIL WASHING



This technology is used to treat oil-containing soils, sandy soils and loam soils. Oil-contaminated soils are washed by the special unit designed and developed by Arkoil. Oil-contaminated soils are homogenized. After being treated by compressed air, water and steam, homogenized material is separated into three fractions.

Three fractions:

- Oil (returned to the Client)
- Water (recycled)
- Sediments (transported to the bioremediation site)

Safety

- No chemicals used
- The technology compliance with the highest environmental standards
- No negative impact of the system on the environment

Profit

- Oil recovery
- Recovered oil is substantially free of mechanical impurities
- Water is recycled (closed loop principle)
- Significant reducing of volume waste for disposal
- The produced soil can be safely used within the Client's territory

Flexibility

- No weather or seasonal restrictions
- Tailored to the Clients' special needs and requirements
- High speed and efficiency of the work performed due to the technology mobility

MICROBIOLOGICAL REMEDIATION

What is the treatment degree of soil and sludge?

The total petroleum hydrocarbon content is less than 1% after microbiological remediation.

Can indigenous strains be isolated locally?

Yes, they can.

Is the generated soil suitable for planting grass?

Yes, it is. Plants start growing after microbiological remediation completion.

There is a concern that the microorganisms can damage oilfields.

Microorganisms cannot penetrate deeply as special conditions are required for their survival, the most important of which are oxygen and water.

Are large areas required for microbiological remediation?

The size of the area is determined by the amount of waste and required treatment duration. E.g. a 1-ha site is required to remediate up to 6,000 t of oil sludge within 2 months. Microorganisms can be applied for in situ remediation as well, so no additional area is needed.

What is the total petroleum hydrocarbon content in the oil sludge prior to microbiological remediation?

There is no content limit.

OIL SLUDGE TREATMENT

What can be further done with the cake?

We suggest applying microbiological remediation. Incineration or another method, used by the Client, can alsc be applied.

What is the capacity of the system?

The capacity may vary depending on the amount of waste and Client's requirements. Minimum capacity is 5 tons per hour.

Does the system require much water?

No, as it is a closed cycle system. The water is circulating

Can you suggest another method of oil-containing waste treatment?

The schemes proposed herein demonstrate particular examples of the technology usage, which have proven effective. After performing engineering survey, our specialists always offer the most effective and beneficial solution, suitable for a particular case.

SOIL AND GROUNDWATER CLEANING

Do the contaminated soil and water need to be transported to another place/location for disposal?

No, it's not required. The whole process can be performed in the contaminated area without soil excavation.

Is there much water required for soil washing?

No, due to closed-cycle principle, the water is circulating.

What is used to perform soil and groundwater cleaning?

Depending on the contamination, hot water, steam, surface active agents, biological preparation can be used.

What is the degree of soil cleaning?

Biological preparation can be used to ensure complete neutralization of hydrocarbons and activation of indigenous bacteria.

Is there a possibility of soil erosion?

No, there isn't, as water supply dynamics is determined based on the soil characteristics. Additionally, continuous monitoring of the pumped fluid is performed. .

Should a filtration-proof wall be arranged in any case? What is the reason for arranging a filtration-proof wall?

A filtration-proof wall is necessary where there is a risk of contamination spread.

EX-SITU SOIL WASHING

Do you use any chemicals within treatment process?

Within the main cycle of treatment process, chemicals are not used. However, to increase the quality of oil and water separation coagulants can be applied on the last stage if it is approved by the Client.

Does the system require much water?

No, as it is a closed-cycle system. The water is circulating.

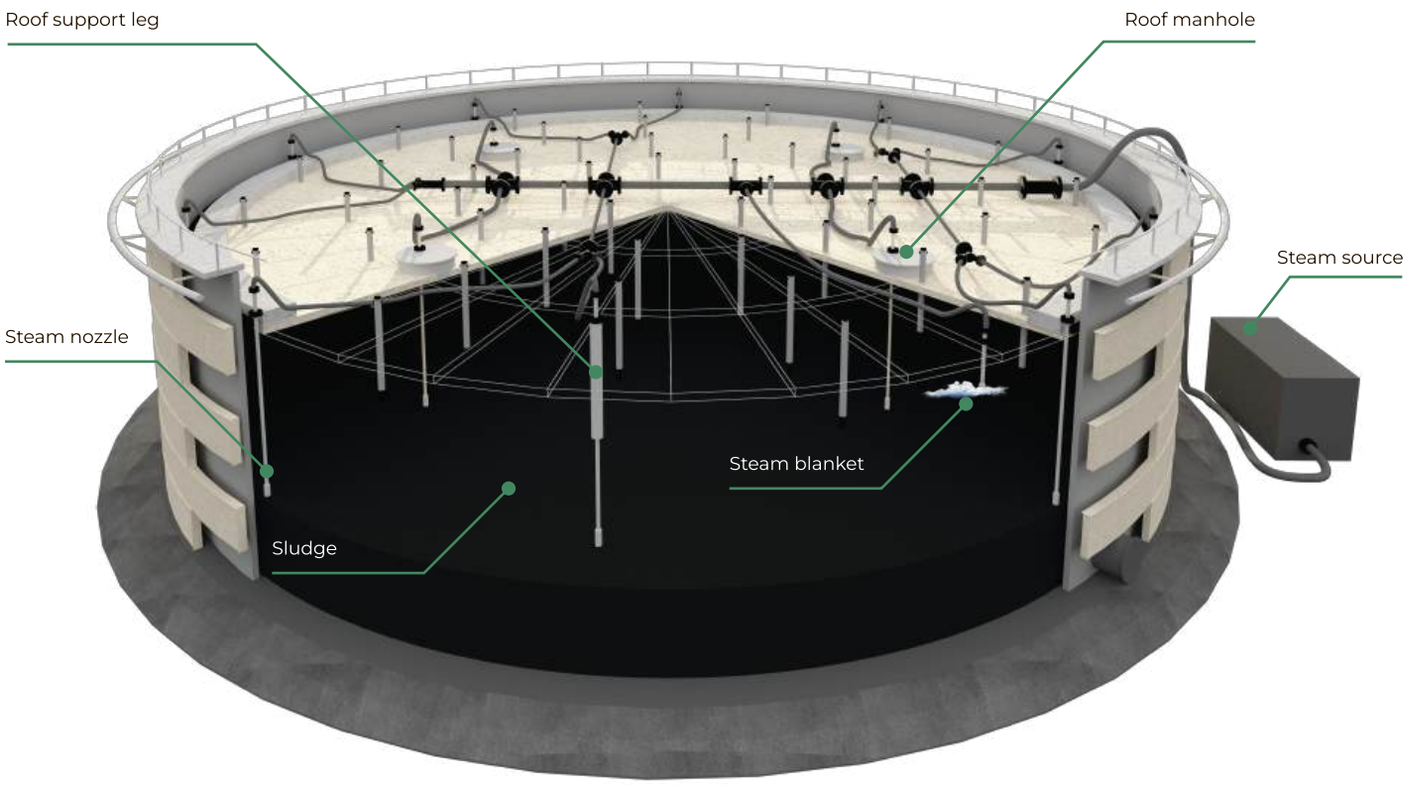
Where can the generated soil be applied?

Technical soil is used for backfilling of ravines, construction sites and landscaping.

Are there any ambient temperature restrictions for treatment process?

No, there are not. The cleaning technology has proved to be effective in extreme weather conditions (low and high temperatures, high humidity, etc.).

TANK STEAMING PLAN



Steam is supplied into the oil sludge through specially designed steam nozzles

Steam nozzles installation can be performed:

- Through the space between tank shell and tank roof seal
- Through the roof manholes
- Through the roof support legs sleeves

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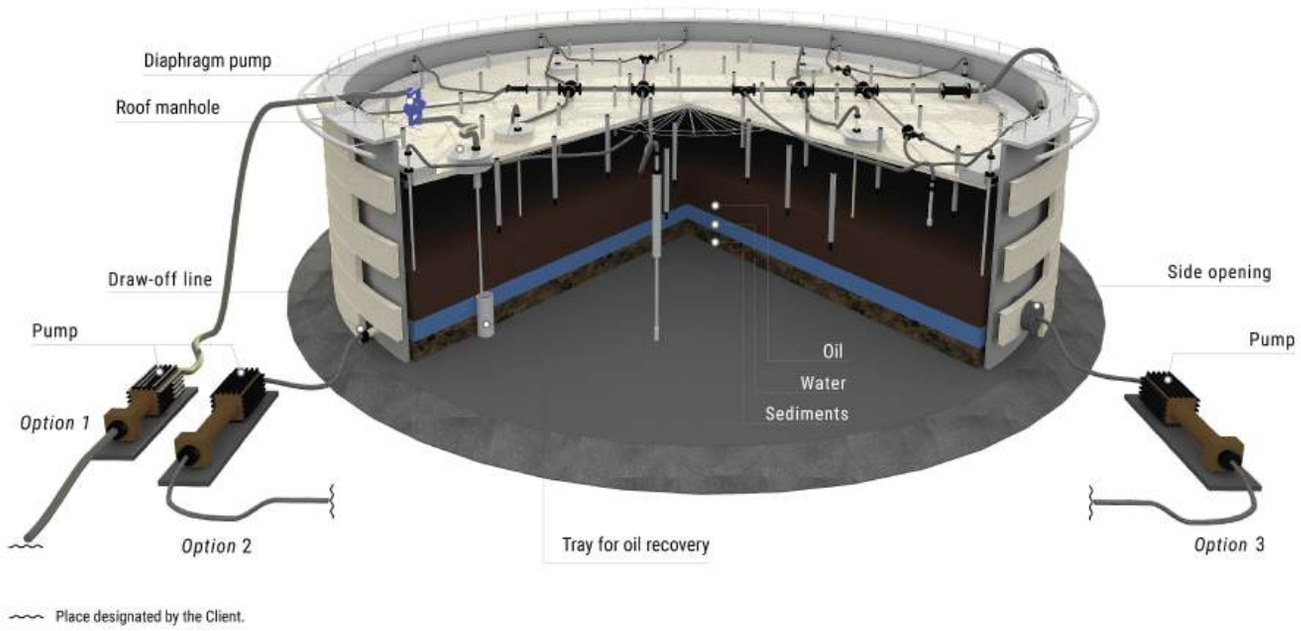
Any nozzles installation option is available upon the Client's request

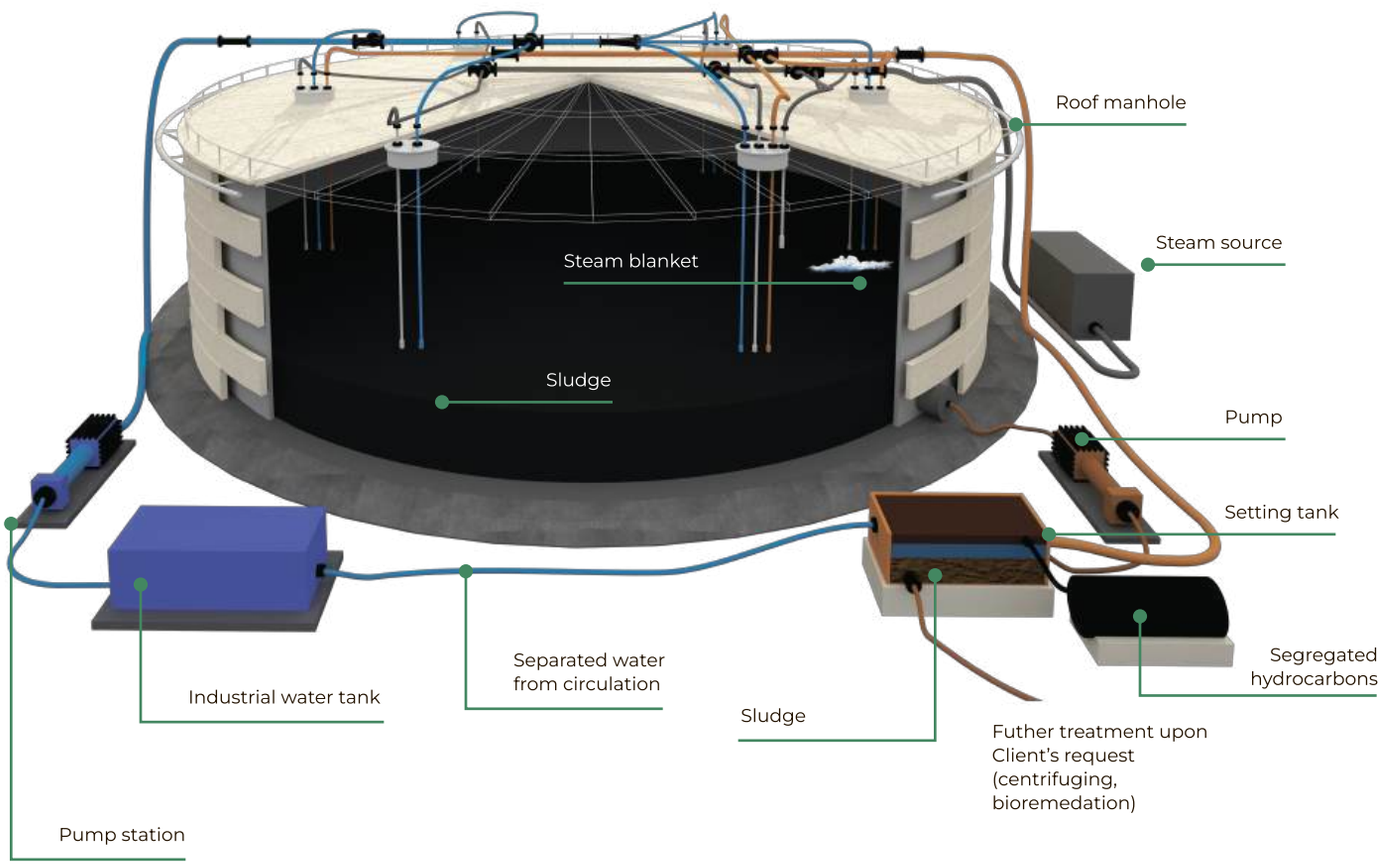
OIL RECOVERY PLAN



As a result of steam cleaning, the inner side of the shell, the underside of the roof, and roof support legs are clean and oil-free; the oil sludge is separated into three layers (recovered oil, water, sediments)

Oil recovery can be performed:

- Through a roof manhole (option 1)
- Through a draw-off line (option 2)
- Through a side opening (option 3), if the oil sludge level is lower than the level of the side opening



Water injection
Slurry pump-out
Steam supply

The system is applicable for tanks containing sludge with high content of asphaltens, sulphur or low content of hydrocarbons, and also for heavy oil tanks.

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Safety

- No chemicals, additional crude oil or oil products used
- No personnel exposure inside the tank until the total degassing of the tank
- No emissions to the atmosphere
- Maintenance of the tank's integrity

Profit

- Recovery of 95-97% of oil
- Profit from oil recovery often significantly exceeds the expenses for the services
- The recovered product is substantially free of mechanical impurities
- Minimal disposal of sediments

Flexibility

- No weather or seasonal restrictions
- Applicable to any tank capacity and roof type
- Applicable to damaged tanks
- Tailored to the clients' special needs and requirements

Time

- Simultaneous cleaning and oil recovery
- Minimal tank downtime against conventional method

COMPETITIVE ADVANTAGES OF ARKOIL TANK CLEANING SOLUTIONS OVER COW-BASED METHODS

ADVANTAGES	Crude oil washing	ARKOIL
Economic efficiency		
Return of the recovered oil to the Client	✓	✓
Profit from the oil recovery often significantly exceeds the expenses for the tank cleaning services	✓	✓
Time-efficient mobilization due to the technology mobility	✗	✓
Unnecessity of the inert gas (nitrogen) injection into the tank	✗	✓
Maintenance of the tank's integrity	✗	✓
Simultaneous cleaning and oil recovery	✗	✓
Reduction of the intervention time and the tank non availability period	✓	✓
Non-application or any cutter stocks or chemical agents	✗	✓
Application results		
Recovered oil is substantially free of sediments	✓	✓
Drained water is safe and can be discharged into the industrial sewage system	✓	✓
High degree of sediments cleaning from hydrocarbons	✓	✓
Tank internals are clean and oil-free after the oil recovery without any additional washing	✗	✓
Safety		
No personnel exposure inside the tank	✓	✓
No emissions to the atmosphere	✓	✓
No risk of the electrostatic energy formation	✗	✓
Flexibility		
Technology can be used for damaged tanks	✗	✓
Technology effectiveness in case the oil sludge height is less than 0.6 - 1 m	✗	✓
No weather or seasonal restrictions	✗	✓
Technology can be tailored to the Clients' special needs and requirements	✗	✓
Technology is applicable to any tank size, design and roof type	✗	✓
Possibility of the application for a double deck roof tank	✗	✓

✓ method fits the point

✗ method misfits the point

ADVANTAGES	Conventional method	ARKOIL
Economic efficiency		
Return of 96 - 97 % of the recovered oil to the Client	✗	✓
Profit from the oil recovery often significantly exceeds the expenses for the tank cleaning services	✗	✓
Maintenance of the tank's integrity	✗	✓
Simultaneous cleaning and oil recovery	✗	✓
Reduction of the intervention time and the tank non-availability period	✗	✓
Non application of any cutter stocks or chemical agents	✗	✓
Application results		
Recovered oil is substantially free of sediments	✗	✓
Drained water is safe and can be discharged into the industrial sewage system	✗	✓
High degree of sediments cleaning from hydrocarbons	✗	✓
Minimum sediments to dispose	✗	✓
Tank internals are clean and oil-free after the oil recovery without any additional washing	✗	✓
Safety		
No personnel exposure inside the tank	✗	✓
Flexibility		
Technology can be used for damaged tanks	✗	✓
No weather or seasonal restrictions	✗	✓
Technology can be tailored to the Clients' special needs and requirements	✗	✓
Technology is applicable to any tank size, design and roof type	✗	✓

✓ method fits the point

✗ method misfits the point

Is steam safe for tank internals (painting, coating, accessories, etc.) and staff involved into tank cleaning operations?

Yes, it is. Steaming as a standard process is widely used in oil industry for cleaning of vessels, hoses, including rubber hoses. Steam is supplied straight into the sludge. Steam jets are not directed towards the tank internals, so steam does not heat or damage them. During steaming, tank cleaning operations are performed without staff presence inside the tank.

Is this technology suitable for tanks with floating or fixed roofs?

The proposed technology can be applied for floating roof tanks, fixed roof tanks and fixed roof tanks with internal floating roofs.

Where do you get steam from?

It can be sourced either from a steam line (if available on site) or a steam generator.

How nozzles are installed inside the tank?

Steam nozzles can be installed:

- Through the space between tank shell and tank roof seal
- Through the roof manholes
- Through the roof support legs sleeves

Do you use any chemicals while the tank cleaning process?

No, we do not. It helps us to keep the technology green and environmentally friendly. Moreover, it helps to avoid any damage to pipelines and/or other facilities.

What is the amount and the quality of the recovered oil?

Up to 97% of oil can be recovered. Due to the high quality and compliance with the requirements, the recovered oil can be returned to the Client.

Where can the recovered oil be transferred after cleaning?

It can be transferred into another operating crude oil tank or production line or another place designated by the Client.

What is the procedure for pumping out the recovered oil?

Oil recovery can be performed:

- Through a roof manhole
- Through a draw-off line
- Through a side opening if the oil sludge level is lower than the level of the side opening

Is nitrogen required to prevent emissions to the atmosphere?

No, it is not. As the steam blanket is used.

Are there any emissions to the atmosphere?

No, there are not.

Before the inlet of the steam directly into the oil sludge, the steam is supplied into the space between the sludge and the roof. Thus, the steam blanket appears, which prevents possible emissions of gases to the atmosphere.

Does your tank cleaning technology require cold cutting?

No, it is not required. This is one of the advantages of the technology over the other tank cleaning methods - maintenance of tank integrity

How many containers are required to deliver the tank cleaning system to the site?

The tank cleaning system can be transported in a 40 ft. container, so it can be mobilized within a very short time.

Is your tank cleaning technology cost-effective?

Yes, it is. The benefits gained by the Client are as follows:

- Minimal tank downtime against other methods
- Minimal disposal of sediments
- High value of oil recovery

Are there any ambient temperature restrictions for tank cleaning operations?

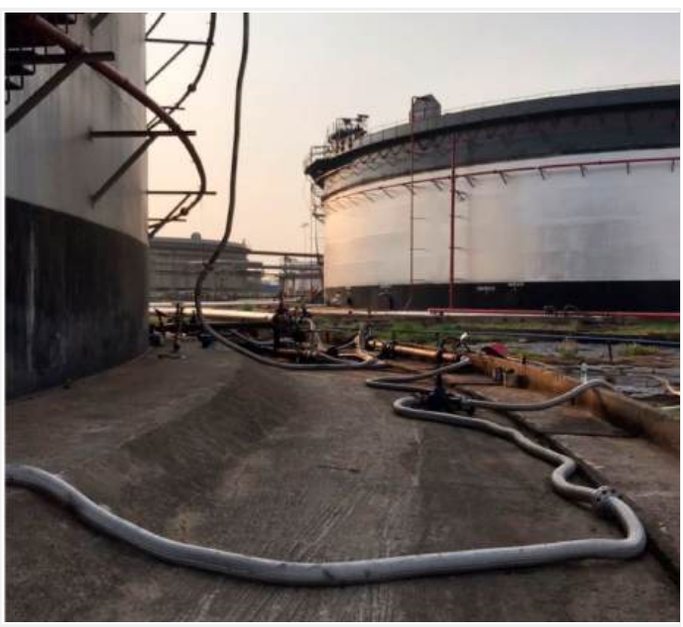
No, there are not. The tank cleaning technology proved to be effective at extreme weather conditions low and high temperatures, high humidity, etc.).

Why do you claim your technology can be applied for damaged tanks?

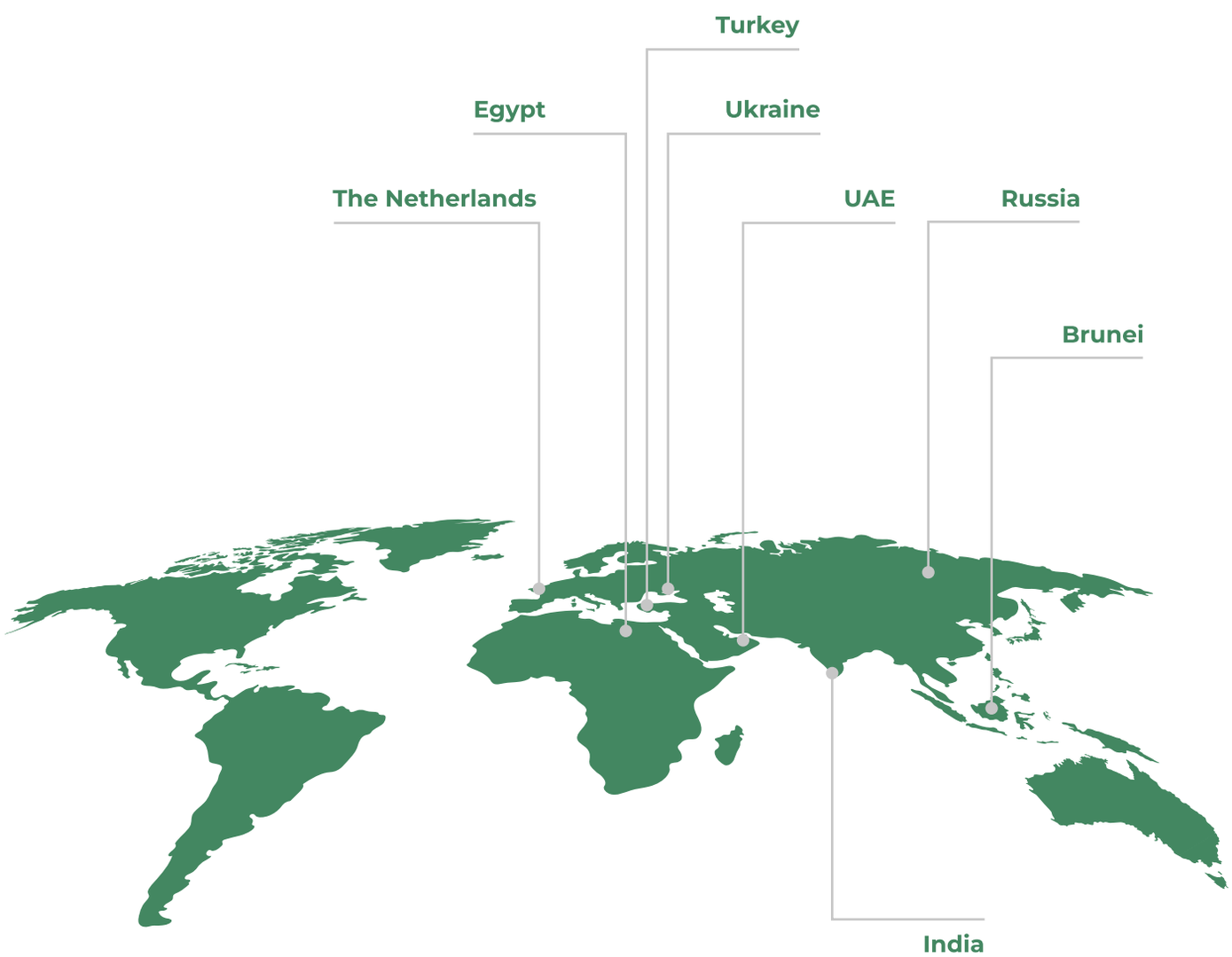
- The technology does not require any staff presence inside the tank during steaming and oil recovery stages
- Steam nozzles can be immersed into the sludge from any available location, not only through the roof.
- Arkoil has an extensive experience in cleaning of tanks with damaged roofs, collapsed pontoons, leaking bottoms, etc. The system can be customized to any type of damage

ENVIRONMENTAL PROJECT PHOTOS

TANK CLEANING PROJECT PHOTOS



TANK CLEANING PROJECT PHOTOS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