Decontamination of soil, ground water and water surfaces according biotechnology SOILEX®

POLYINFORM
Providing industrial and environmental safety

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POLYINFORM SINCE 1989

MAIN ACTIVITIES:

- Providing environmental safety
- Industrial construction
- Industrial safety expertise

Scientific and Technical Base:

- 7 doctors of sciences
- Up to 200 professional employees
- Own scientific and industrial equipment
- Own scientific labs
- Headquarter in Saint-Petersburg (Russia)

Our Customers:

- NKK Corporation, Japan; «Total», «Halliburton», USA; Unilever SNG, Great Britain; «Total Fina Elf», France; «Mahrukat», Syria; Beijing Gas, China; Dragon Oil (UAE)
- "Lukoil" Oil Company; "Transneft"; "Diamonds of Russia -Sakha" Co. Ltd; "TNK-BP"; "Moscow Oil Refinery"; "Rosneft" Corp; ROS "United Power Systems of Russia"; "Russian Railways"; Ministry of Defense; Ministry of the Natural Resources.
The basis of the technology:

**SPECIFIC ASSOCIATION MICROBES-DESTRUCTORS, EFFECTIVE FOR A WIDE SPECTRUM OF POLLUTANTS**

The technology includes the following activities:
mechanical, agro-chemical, sorption, biological.

POLYINFORM owns one of the largest private collection of the microorganisms of the environmental safety target, including over 100 cultures, selected from the contaminated places located in different climatic zones.

The collection is registered in World Data Centre for Microorganisms WFCC WDCM 772 Japan, 28.01.98

The applied technology received the positive conclusion of the Natural Recourses Ministry of Russia.

The technical solutions which are the essence of the technology are protected by **16 patents of Russia**
Bacterial strains of the biological product used hydrocarbons and heavy fractions of petroleum as an energy source for their livelihood.

During the first day after introduction of a biological product microorganisms are activated, there is an increase of their amount and an irreversible process of decomposition of petroleum products to environmentally safe non-toxic products of bacterial metabolism begins.

After the decomposition of mineral oil the mass of micro-organisms not provided with nutrient die off, being a food for intensifying indigenous microflora.
ADVANTAGES OF SOILEX® BIOTECHNOLOGY:

- Short time necessary for decontamination (3-8 months);
- Absolutely environmental friendly technology;
- High destructive activity in the wide pH (4.5-8.5) and temperature range (3 – 40°C);
- Ability of treatment even in the presence of heavy metals including mercury and nitrates;
- Adaptability to specific needs;
- Full rehabilitation of the environment at the contaminated territory
PURIFICATION EFFICIENCY OF SOILEX® BIOTECHNOLOGY:

SOILEX® biotechnology is efficient for wide spectrum of contaminates

Oil contamination:
Black oil – 95 %; Technical oil – 97 %; Benzine – 98 %

Contamination with black oil - control sample, 2 months after the contamination

Contamination with black oil - test sample, 2 months after the beginning of the treatment. The initial concentration decreased by 70%
SOILEX® BIOTECHNOLOGY - STAGES OF WORKS

I. DETAILED ENGINEERING INVESTIGATION

1. The site inspection
2. Engineering and land inspection
3. Geological engineering inspection
4. Engineering and environmental inspection (sampling of contaminated soil and water)

II. ANALYSIS

Laboratory microbiological and chemical investigations

III. DESIGN WORK

1. Drawing 3D map of the contamination
2. Selection of the optimal treatment scheme
3. Breeding and selection of useful microorganisms strains-destructors, effective for this type of pollution
4. Choosing remediation strategy
5. Development and coordination of the decontamination project
6. Producing of a biological product
SOILEX® BIOTECHNOLOGY - STAGES OF WORKS

IV. FIELD WORKS
1. Aeration
2. Applying of the texture agent (if necessary)
3. Bio-preparation applying
4. Watering and fertilizers applying
5. Monitoring

V. HANDING THE OBJECT TO THE CUSTOMER
1. Control sampling
2. Independent expertise
DRAWING OF 3D MAP OF THE CONTAMINATION

General scheme of the contamination

Stratified 3D map of the pollution
SOILEX® BIOTECHNOLOGY

The technological line for producing of liquid form of SOILEX®
Cultivation of oil oxidizing bacteria association in the special tanks

After 6 hours

After 12 hours

After 24 hours
TECHNOLOGICAL SCHEME OF SOIL AND GROUND WATER TREATMENT (depth up to 5 m)

Contamination concentration

Low
Less than 50 g/kg

SOILEX® and fertilizer (NPK) applying, aeration and watering

Clean environment

Medium
from 50 to 150 g/kg

Applying of the texture agent for concentration decreasing

The residual contamination with the low concentration

High
More than 150 (up to 500) g/kg

Pumping out the free oil

Oil sludge to the special recultivation site

Oil recovery

Stock-tank oil
Object: "Diamonds of Russia-Sakha"
Over 15 000 m³ of oil contaminated soil were treated

Before the treatment
June

The treatment process
July

After the treatment
August
EXPERIENCE

Object: Oil Company «UGANSKNEFTEGAZ», 2001 - 2003

Liquidation of the aftermaths of oil pipeline break. The square of contamination over 3.5 ha

Before the treatment

After the treatment
EXPERIENCE

Object: «ROSNEFT-SAMOTLORNEFTEGAZ», 2013

Technical and biological recultivation of oil contaminated soil at the territory of 4.4 ha

Before SOILEX ® applied

10 days after SOILEX ® applied
EXPERIENCE


Executed works: remediation and recultivation of oil contaminated soil, totally 70 hectares.

Contract signed for 2016 – 2018: 60 ha

Before the works started

After the treatment and recultivation according SOILEX® biotechnology
TECHNOLOGICAL SCHEME OF WATER SURFACES TREATMENT

Contamination concentration

- **Low**
  - Less than 30 mg/l
  - SOILEX® AQUA at the special carrier applying
  - Clean environment

- **Medium**
  - From 30 up to 80 mg/l
  - Sorbent applying for concentration decreasing

- **High**
  - More than 80 (up to 500) mg/l
  - Pumping out the free oil (booms, skimmers)

  - Medium concentration
  - Oil recovery
  - Stock-tank oil
EXPERIENCE

Liquidation of the accidental black oil and diesel fuel spill at the rail way station Bologoe (the customer - "Russian Railways")

• The oil film at the water surface was from 1 to 5 mm
• The concentration of oil products in water reached 300 mg/l
• The length of the trench was 2000 m

Before the treatment  Sorbents applying  After the treatment
The train crash at the railway station Ujta (the customer - "Russian Railways")

- The spill of 80 t of black oil
- About 6 ha contaminated

As a result of the executed works the vegetation was almost completely restored, the oil film from water surface was removed.
EXPERIENCE

Object: «Russian Railways». Cleaning of oil contaminated pond at Velikie Luki station

Contaminated pond

Application of SOILEX ® with floating sorbent

The pond after the treatment

Object: AK «Diamonds of Russia - Sakha». Prevention of river Lena pollution
EXPERIENCE

Object: OAO «Rosneft» Tuapse Refinery
Cleaning of oil contaminated soil and ground water at the territory of Refinery by SOILEX biotechnology.
The depth of contaminated was up to 17 m, the square - 2 ha

Object: Ministry of Defense of Russia, object Savvatia
Cleaning of underground water at the square of 10 ha, contaminated with 15 500 tones of aviation fuel
CASE STUDY

Recultivation of Tuapse Refinery

Targets:

Decontaminate soil, on surface and underground water, as well as aeration zones soil at the territory of Tuapse Refinery
List of works implemented:

- Reconnaissance survey of the object and its surrounding areas;
- Drilling the exploration wells to clarify the geological section of the water level, determine the depth, power, and area of distribution of the underground oil pollution;
- Evaluation of the filtration properties of soil;
- Periodic measurements of groundwater levels and gravity-moving oil to track the dynamics of fluctuations of these levels in time;
- Sampling of soil and water from the surface and from the wells to clarify the presence and degree of contamination of soil and groundwater investigation of the properties and composition of the soil, water, and oil pollution;
- Simulation modeling;
- Geodetic work necessary to create contamination maps.
### Characteristics of the contaminated soil

<table>
<thead>
<tr>
<th>Contamination level</th>
<th>Hydrocarbons contamination, g/kg</th>
<th>The volume of contamination, m³</th>
<th>The total weight of oil products, t</th>
</tr>
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<tr>
<td>1</td>
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<td>&gt;5</td>
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<td>62023</td>
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<tr>
<td>TOTAL</td>
<td>for decontamination</td>
<td>2927660</td>
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</table>

Over 1,2 million m³ of oil contaminated soil was treated. The square of the underground lens of free oil was 120 000 m²
Conclusion:

1. After four months of treatment the concentration of oil products at the territory of Tuapse Refinery decreased by 85% up to the required norm - less than 3 g/kg

2. The efficiency of treatment of soil from oil and oil products at the depth of up 9 m reached 70 - 99%
POLYINFORM possesses all necessary licenses and certificates on biopreparations, their manufacturing and the method of soil and water cleaning.

SOILEX® BIOTECHNOLOGY - 16 PATENTS
WE MAKE THE WORLD ECOLOGICALLY SOUND!

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