

# **BIOREMEDIATION OF CONTAMINATED ENVIRONMENT IN RUSSIA: UP-TO-DATE STATE, PROBLEMS, NEW APPROACHES, PERSPECTIVES**

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«POLYINFORM» Ltd.

All-Russian Institute for Plant Protection  
Academy of Agricultural Sciences

*Environmental protection*

15 YEARS IN THE FIELD  
OF ENVIRONMENTAL P  
ROTECTION





**«POLYINFORM» Ltd.**  
**All-Russian Institute for Plant Protection**  
**Academy of Agricultural Sciences**

- **Remediation of soil, water, ground water from oil, petroleum products, technical oils, food fats;**
- **Disposal of oil-wastes and sediments with isolation of petroleum products**



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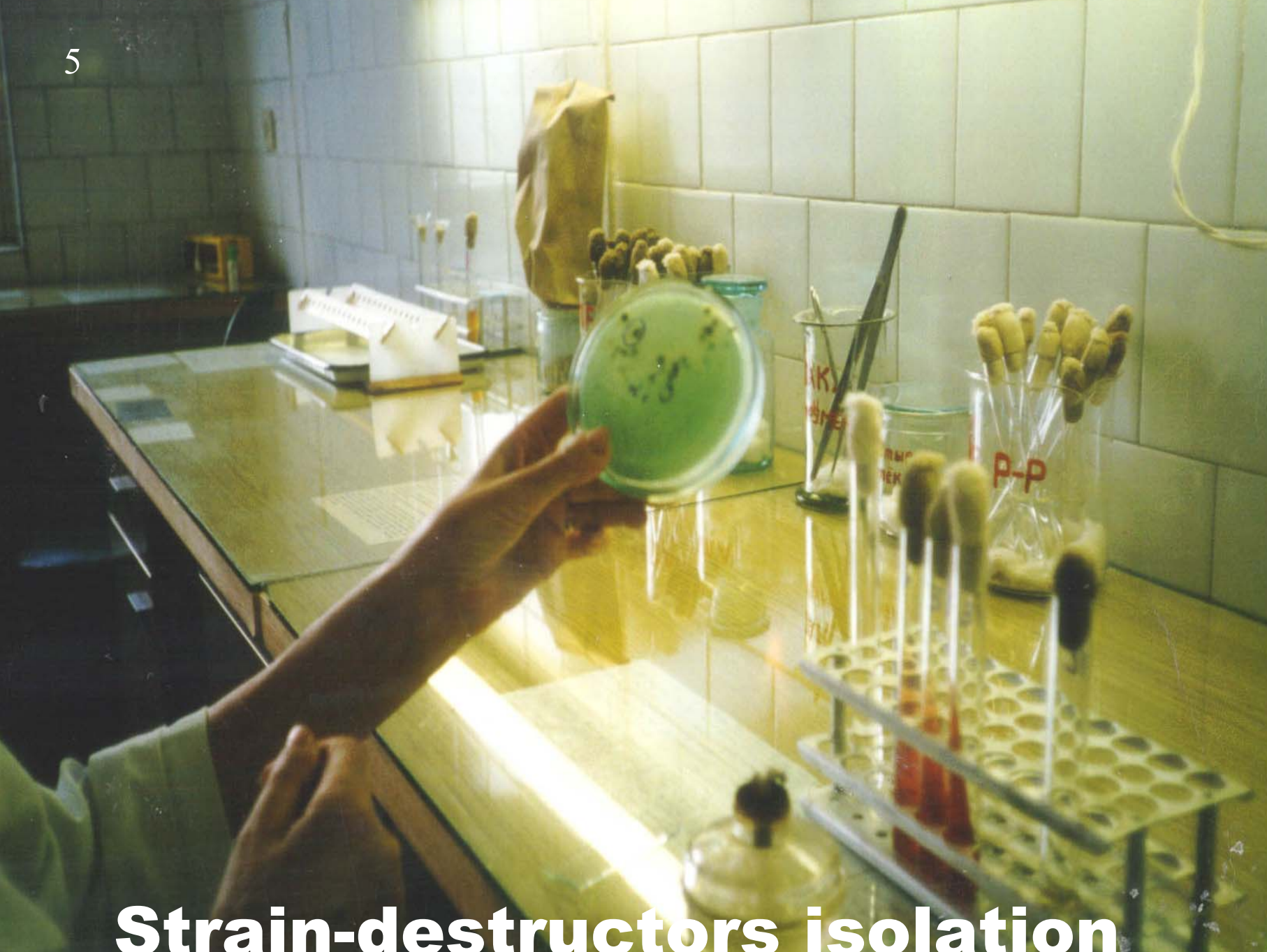
## COLLECTION OF MICROORGANISMS

OVER 100 SPECIES, 1500 STRAINS OF  
BACTERIA, FUNGI, ACTYNOAMYCETES

REGISTERED in the World Data Center of  
Microorganisms, National Institute of Genetics, Japan  
(WFCC WDCM 760)

<http://wdcm.nig.ac.jp>





**Strain-destructors isolation**



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## STRAINS DEGRADING:

- hydrocarbons;
- PAHs (anthracenes, benzopyrenes, chrysenes);
- phenols;
- heptyl;
- tolerant for high concentrations of heavy metals



# THE SOILEX® PROCESS

## I. ECOLOGICAL MONITORING

History of pollution  
Topographical survey,

Analysis (HC, N, P, K, pH)

Laboratory experiments

Choice of cleanup  
approach

## II. LOCALIZATION OF OIL POLLUTION

Water surface: booms, oil traps, filters, sorbents

Soil: banking, sorbents

## III. MECHANICAL REMOVAL OF OIL POLLUTION

Removal of oil polluted soil, pumping of free oil products,  
extraction of vegetation and placing all these on  
recultivation grounds

Building of recultivation grounds

## IV. ABSORBING METHODS

Removal of oil products from water surface and snow cover

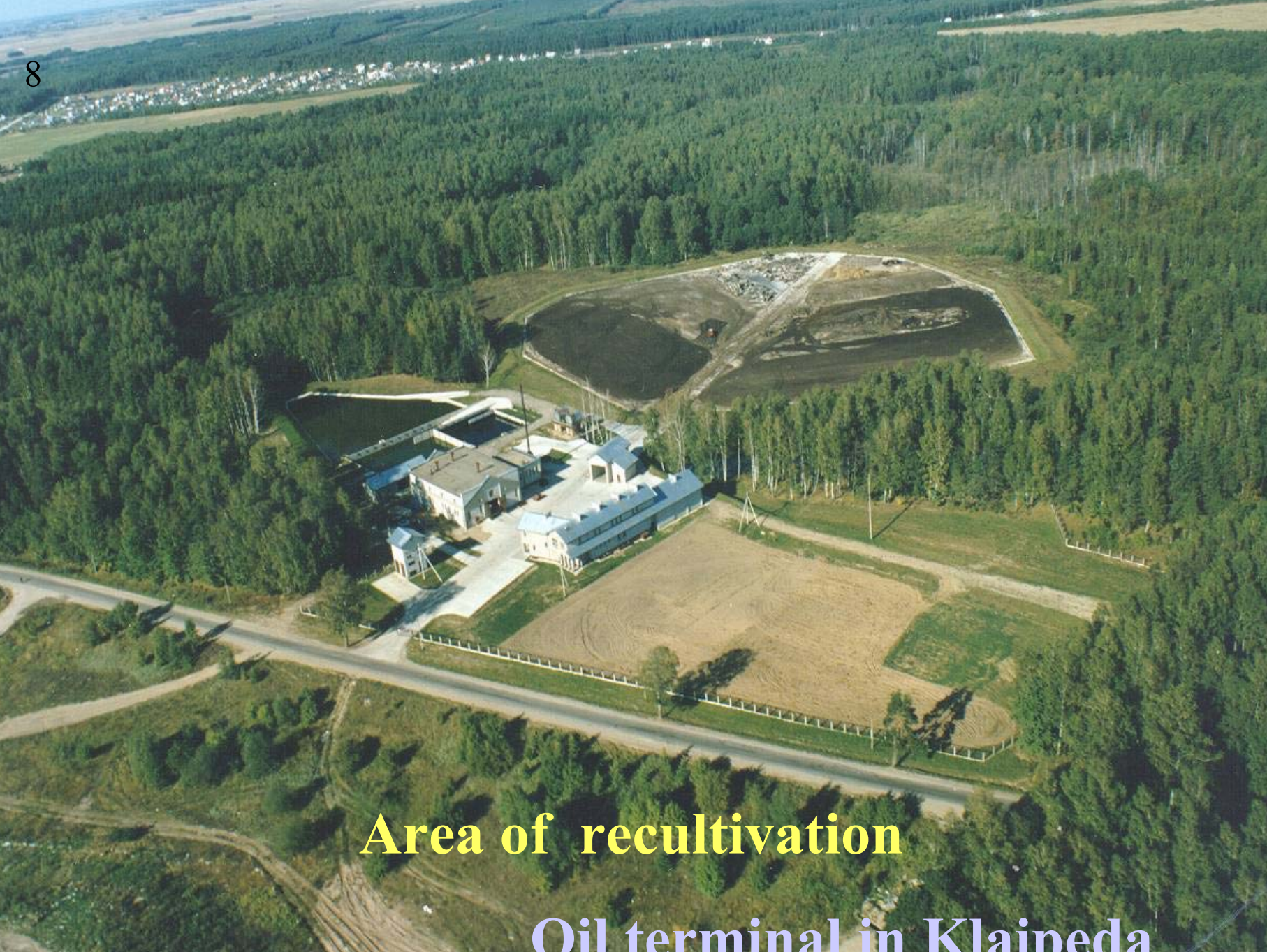
## V. BIOLOGICAL METHOD

The "SOILEX®" biopreparation, land-reclamation measures, fertilizing biopreparations

## VI. CHEMICAL AND MICROBIOLOGICAL CONTROL OF DECONTAMINATION PROCESS

Independent examination, site closure

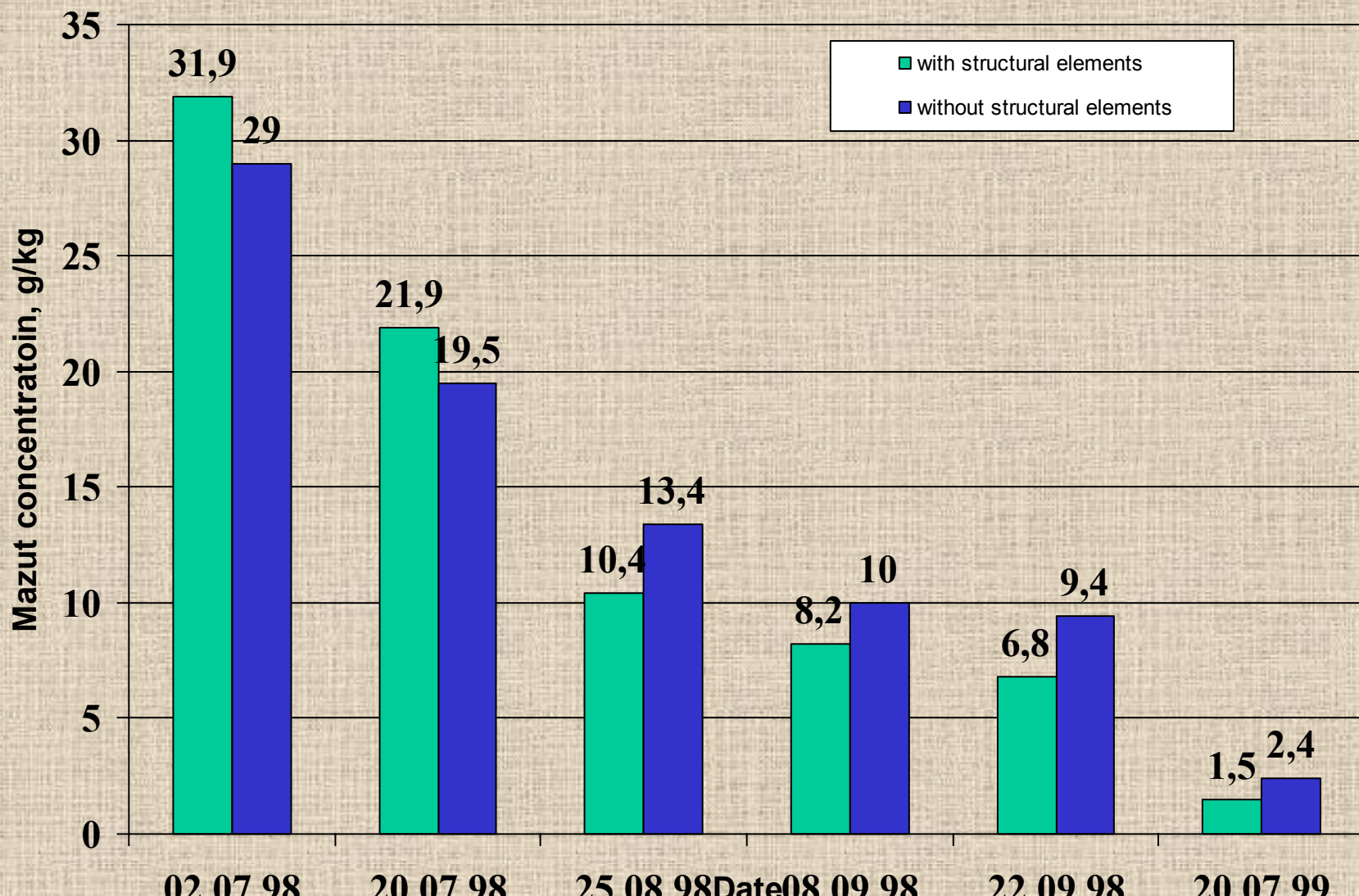




**Area of recultivation**

**Oil terminal in Klaineda**



**Mazut degradation in soil, Lithuania, 1998-1999**



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**THE “TRANSNEFT”**  
**OIL COMPANY, 1994-1995**

**Remediated 35 000 m<sup>3</sup> of soil  
contaminated by 9 000 t spilled  
crude oil**





Heavy oil contamination

THE "TRANSNEFT" OIL COMPANY



Special remediating ground

THE "TRANSNEFT" OIL COMPANY





# Final operations

THE "TRANSNEFT" OIL COMPANY



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## THE “DIAMONDS OF RUSSIA- SAKHA” COMPANY, 1998-2000

**Remediated 14 500 m<sup>2</sup> territory  
contaminated by petroleum  
products**





June 2000

THE "DIAMONDS OF RUSSIA-SAKHA" COMPANY





July 2000

THE “DIAMONDS OF RUSSIA-SAKHA” COMPANY





August 2000

THE “DIAMONDS OF RUSSIA-SAKHA” COMPANY





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# THE “LUKOIL” AND “YUKOS” OIL COMPANIES, 1999-2001

Remediated 79,5 ha of soil,  
wetland and ground water





**Contaminated area before  
treatment**

**“YUKOS” OIL COMPANY**





**After the first course of  
treatment**

**“YUKOS” OIL COMPANY**





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**THE VALDAI NATIONAL**  
**PARK, military bases, 1996-2001**

**Remediated 32 000 m<sup>3</sup> of soil  
polluted by heavy oils**





**Furnace oil spill, 4 000 t**

**THE VALDAI NATIONAL PARK**





**Site after cleaning**

**THE VALDAI NATIONAL PARK**





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# RAILWAY ENTERPRISES, 1995-2003

**Remediated 70120 t of soil  
and 40 000 m<sup>2</sup> surface water**





**Before treatment**

**RAILWAY ENTERPRISES**





# Application of sorbent

RAILWAY ENTERPRISES





**After treatment**

**RAILWAY ENTERPRISES**





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**NKK CORPORATION,**  
**JAPAN, 2001**

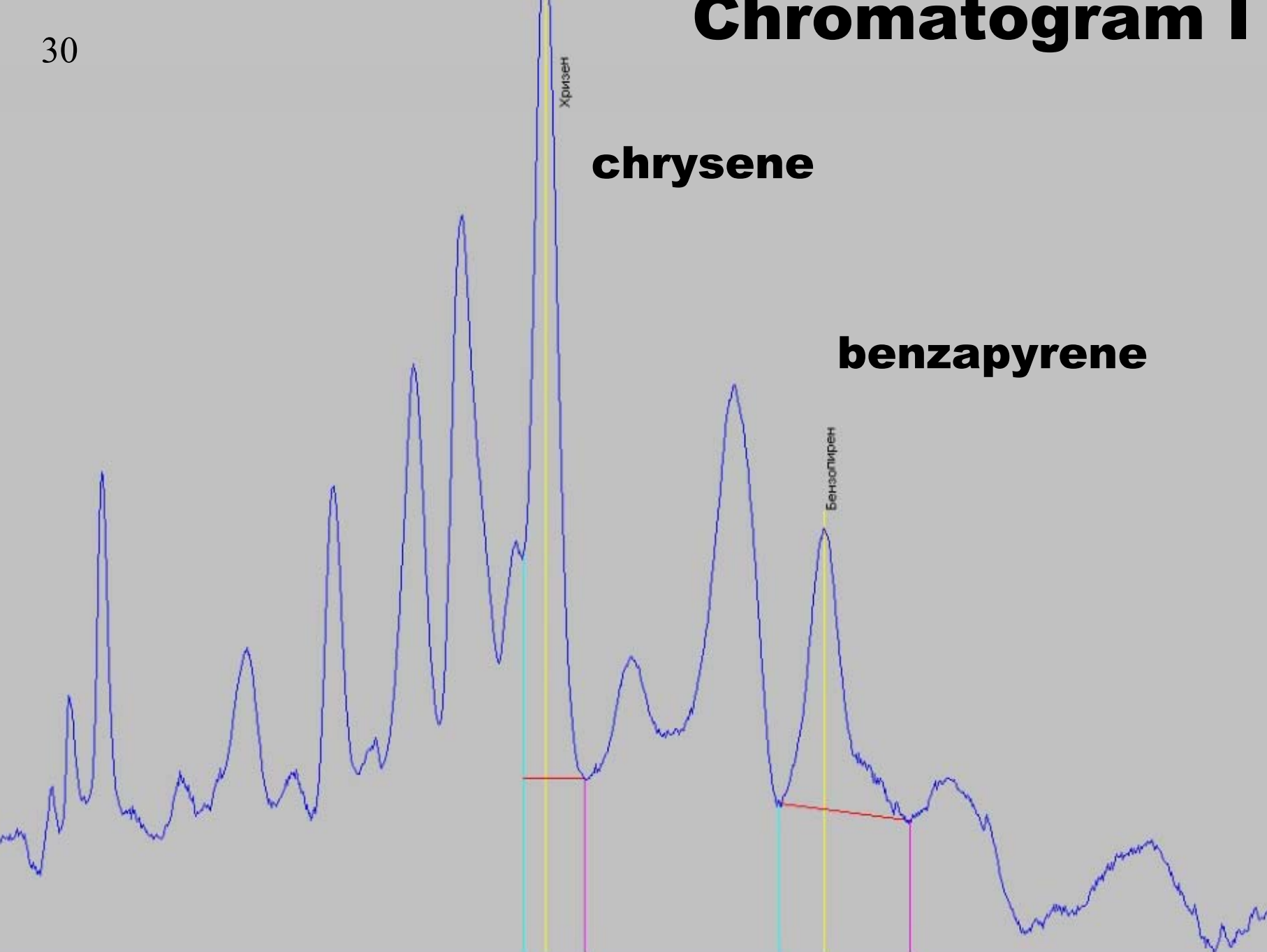
**Field test. Remediation of soil  
contaminated by hydrocarbons,  
PAHs, heavy oil fractions and  
heavy metals**





Test in process

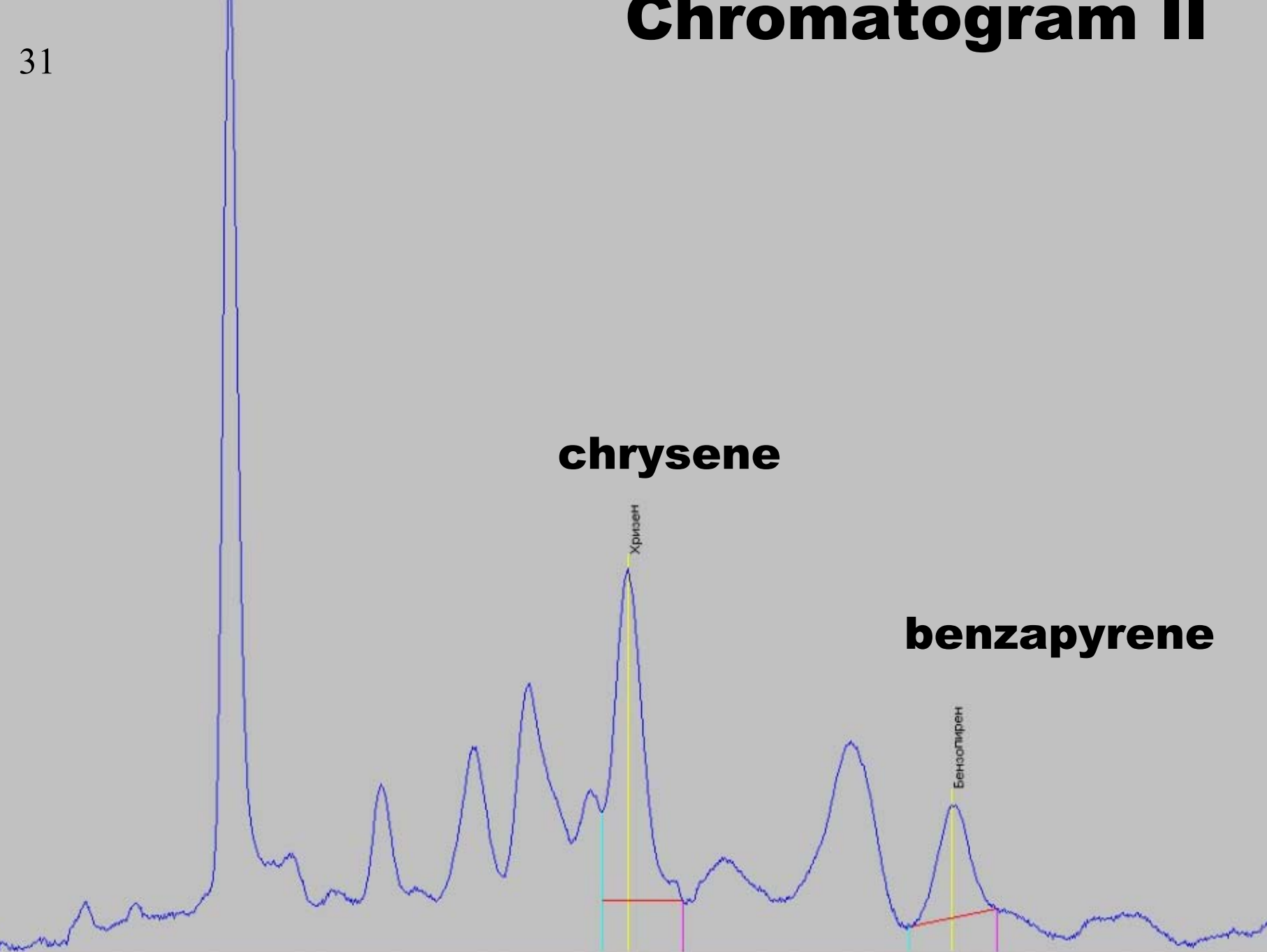
NKK CORPORATION, JAPAN





# Chromatogram II

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**chrysene**

**benzapyrene**



# THE NORTH-WEST OF RUSSIA,

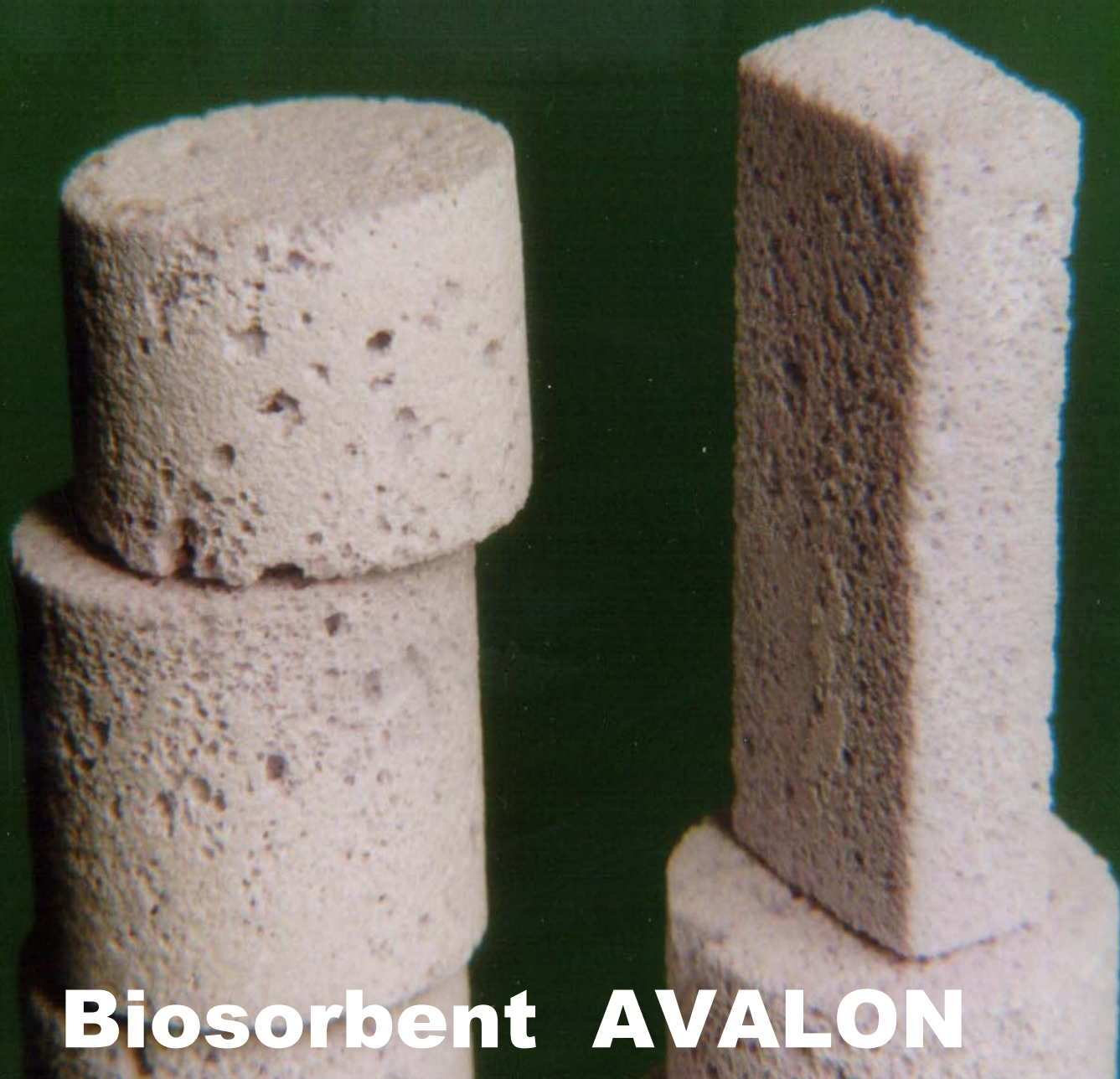
air force bases, 1999-2001

**Remediation of soil and ground water from 15500 t  
kerosene spill in a 10-ha fuel stock**



**Remediation in process**

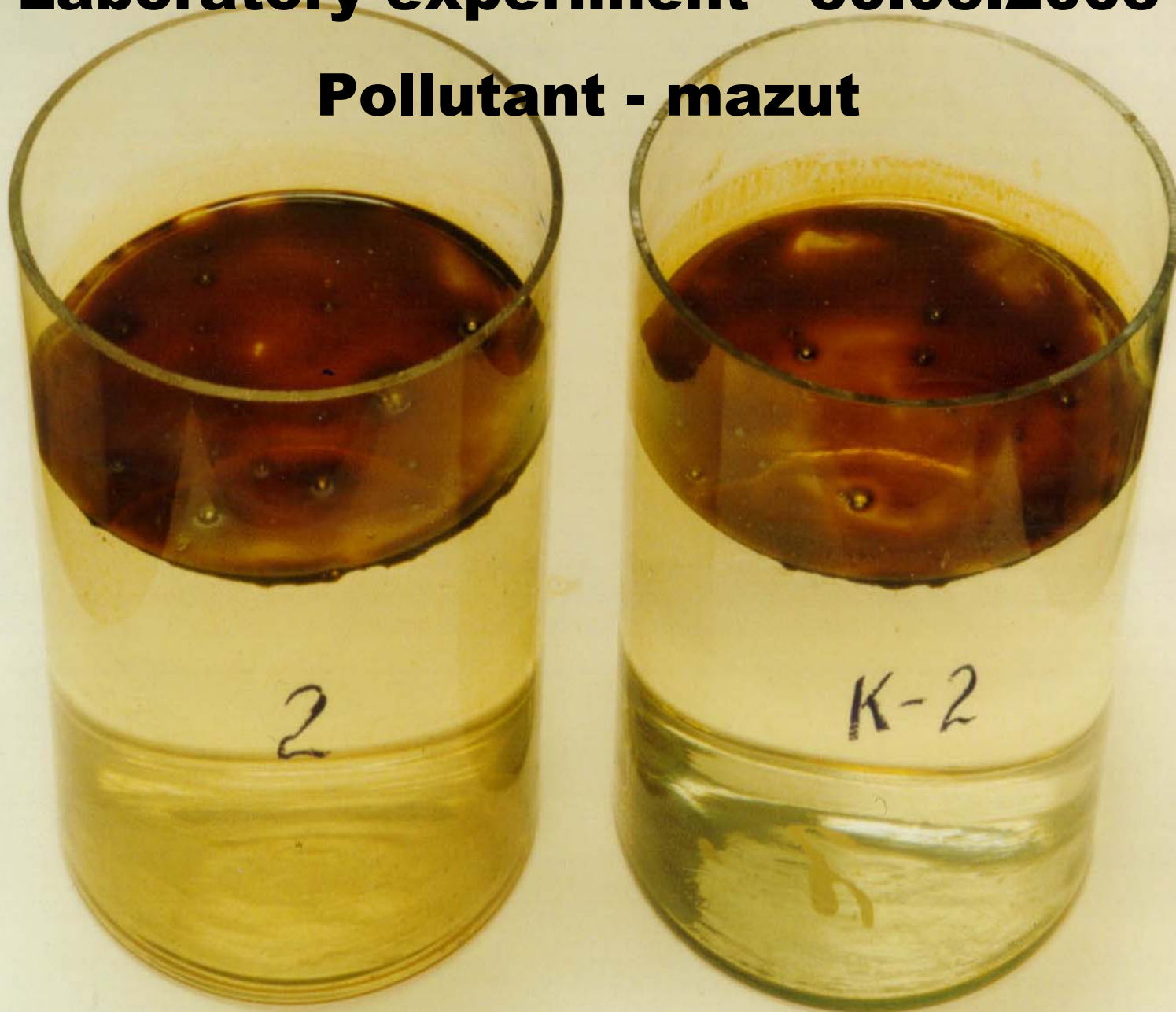




**Biosorbent AVALON**

# Laboratory experiment - 30.05.2003

## Pollutant - mazut











# Treatment by biosorbent



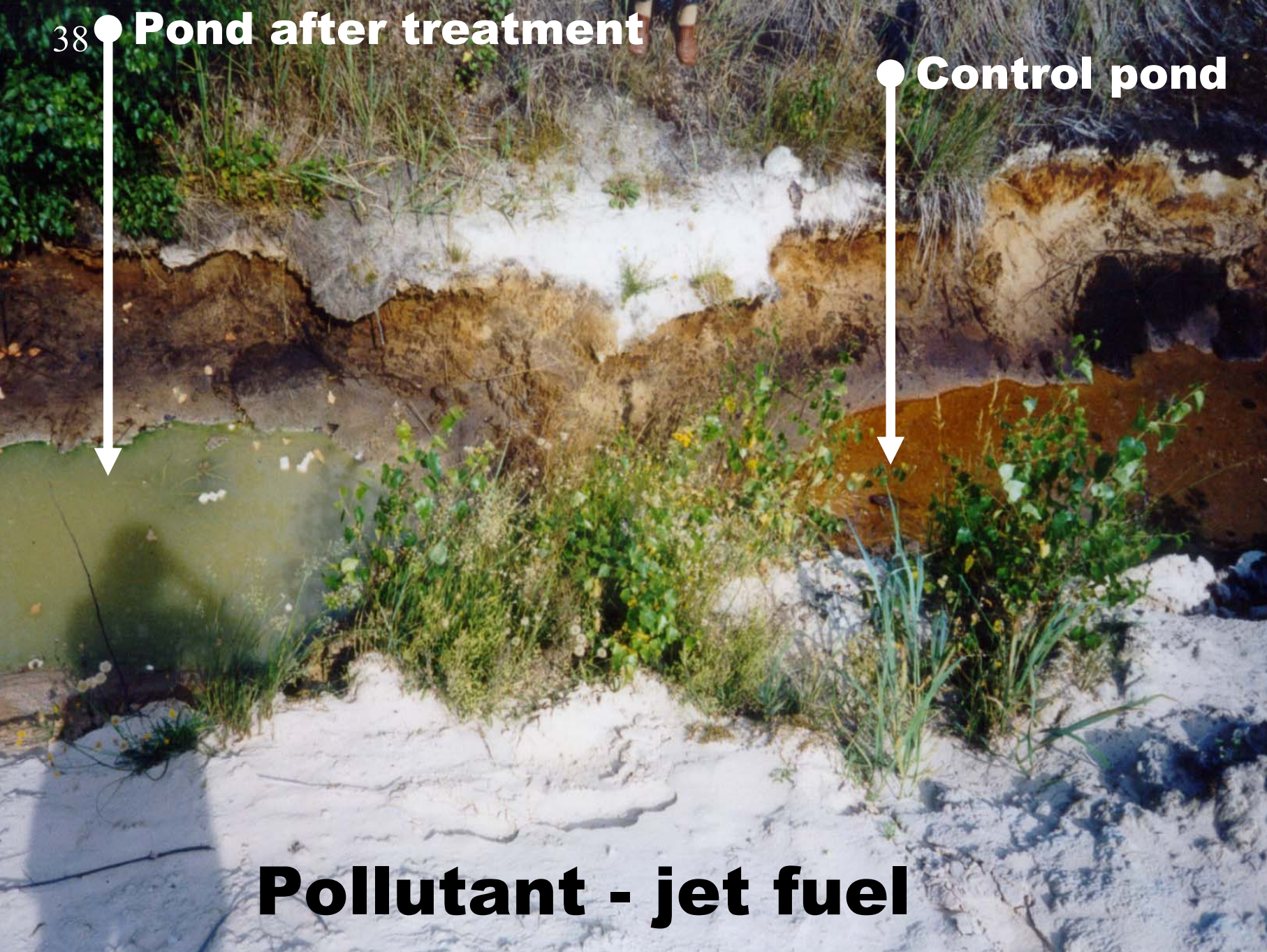


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● **Pond after treatment**

● **Control pond**

**Pollutant - jet fuel**





# Water surface contaminated by jet fuel

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# Trench after application of biopreparation

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**Process of treatment, algae growth**



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**A month later**





**Three month later**

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