

RECO

REGIONAL COOPERATION IN WASTE MANAGEMENT



UNIDO North-Western International
Cleaner Production Centre
St.Petersburg, RUSSIA

Environmentally Safe Technologies Transfer in Russia



Experience of UNIDO NWICPC



Entrepreneurship for Waste
Management
4 - 5 June, 2007. Gdynia, Poland



United Nations Industrial Development Organization

- UNIDO - one of 17 specialized UN agencies
- 172 countries – UNIDO members
- Total/technical support budget of UNIDO in 2006-2007 - € 356 / 185 mln
- Regular/operational budget - € 154 mln/20 mln
- 2800 national and international experts are prepared and employed annually
- Aim: increase of human life quality through the sustainable industrial development



ABOUT UNIDO NWICPC

- Was founded by UNIDO in September 2000, in St.Petersburg as non-profit organization (NGO)
- Is a UNIDO Project started in October, 2001 under support of State Duma Environment Committee (Russian Parliament) and UNIDO donors
- Uses methodology of UNIDO National Cleaner Production Centres
- Main area of activities – Cleaner Production and Waste Management for the industry
- National experts (>then 50) of CPC work on projects under support of UNIDO intern. experts



NWICPC activities area in the North-West RUSSIA

- UNIDO Centre located in the Gulf of Finland
- Operating area - 11 regions of Russia
- Territory – 1.7 mio. km²
- Population – 13.7 mio.
- Developed R&D-sector and industry (oil & gas, transport, energy, shipbuilding, pulp & paper, chemical industry)
- St.-Petersburg is the biggest megapolis in the Baltic Sea region
- 2 large marine ecosystems (Baltic and Barents Seas) and transport system
- over 90 Mio. t/yr of oil and chemicals shipped through Russian ports in the Gulf of Finland
- Common border with West European countries

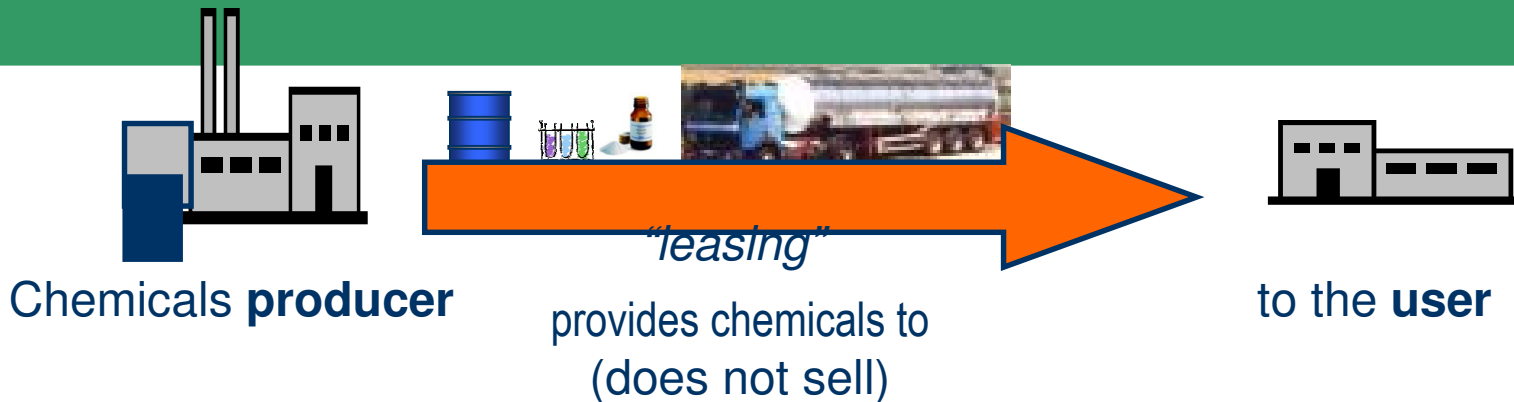


PARTICIPATION IN INTERNATIONAL PROJECTS

- UNIDO NCPCs – NCPPs international network in 40 countries
- Chemical leasing in the context of REACH (EU Directive) & SAICM
- RECO East (MSW management in the Baltic Sea region)
- Processes simulation (optimization by mathematical methods)
- Ecological NEFCO financing: € 350.000 - 400.000, 6% per. a.
- Risk preparedness in the Baltic Sea region (under UNIDO and GEF support) – immediate task



CHL – SERVICE-ORIENTED BUSINESS MODELS



Payment is not for delivered chemical, but for the effect from its application. For example: **not for tons of absorbent**, but for the **number or volume** of (by means of the reagent cleaned tubes, containers, tanks etc.)



Volume of chemicals used **will reduce**, because highest **quantity sold is not the profit factor**.

Key factor is the **optimization** in the course of which the less chemicals more optimally used render the service profitable.



POTENTIAL NEW AREAS FOR CHEMICAL LEASING

- **Water-distributing system, water handling, water treatment**
Efficient use of reagents, waste water treatment optimization
- **The Metal and Galvanic Industry is growing fast in NW Russia – especially in the St. Petersburg area**
Efficient use of chemicals, treatment of waste and water are essential
- **Russian part of the Baltic is the nearest ports for oil, oil-products and liquefied gas for Western Europe with increasing importance due to strategic and global development**
Necessity and precondition for all transport facilities to be cleaned efficiently & with environmentally acceptable methods (e.g. railway, ships, containers, pipe-lines, etc.)



ECO-EFFECTIVE PROJECTS

RELIABLE & SIMPLE SOLUTIONS FOR SEWAGE WATER PURIFICATION

Efficiency of sewage water and industrial wastewater purification:

- oils – not less than 99,9%,
- suspended particles – not less than 98%.

SWTP advantages:

- Possibility to treat sewage at emergency discharge of oil products
- Lower price as compared to foreign analogues at higher efficiency and reliability
- No need in specially trained staff for maintenance;
- Easy to install and to use



EST TRANSFER

MSW INCINERATION PLANT (waste to energy)

1. Incineration of any solid wastes with carbon content over 10%
2. Two-stage incineration process ($t = 1100-1200^{\circ}\text{C}$)
3. Economically profitable mini-plants (power stations) with about 85% efficiency

Technologies of superadiabatic gasification are applicable for:

- Incineration of municipal and industrial solid wastes (MSW \rightarrow syngas \rightarrow energy)
- Processing wornout tires (tires \rightarrow metal, ZnO, oil, syngas \rightarrow energy)
- Processing waste oil, oil sludge, oil-contaminated soil (waste oil \rightarrow oil, syngas \rightarrow energy)
- Gasification of coal wastes and substandard coal (coal \rightarrow tar, syngas \rightarrow energy)
- Processing sewage sludge (sludge \rightarrow syngas \rightarrow energy)
- Processing wood and pulp wastes (wood \rightarrow tar, syngas \rightarrow energy)
- Production of charcoal (wood \rightarrow tar, charcoal, syngas \rightarrow energy)



SUPERADIABATIC PROCESS

- Superadiabatic regimes of filtrational combustion provide means to develop highly efficient technologies for processing combustibles and wastes incineration.
- The process is arranged in two stages.
On the first stage a combustible is gasified in regime of superadiabatic combustion with high energy efficiency.
On the second stage the product gas is burnt in a power-generating unit.

ADVANTAGES of gasification in superadiabatic mode

1. High energy efficiency of gasification: up to 90-95%.
2. Flexibility: fuel gas can be used by various consumers.
3. Possibility to gasify materials with high ash content (up to 90-95%) and high moisture content.



Concentration of pollutants in flue gas for incineration of MSW (prior to cleaning)

mg/m ³	Moving grate incinerator	IPCP method
Flyash	5000	200
NO_x	210	~150
SO₂	280	171
CO	50	4
HCl	300	6
Cd, Tl	0.5	0.1
Hg	0.06	0.01
Pb, Co, Cr, Ni, As, Sn, Bi	60	7.3
Polychlorinated dibenzodioxins / dibenzofurans	10⁻⁵	2*10⁻⁷



DEMONSTRATION PROJECTS

MICROTURBINE HEAT STATIONS: ELECTRICITY AND HEAT

- The micro-gas turbine module is an environment-friendly and low-noisy
- The module provides: electric power - 100 kW, heat – 150 kW
- The overall efficiency – more than 85%



HRCM – TOP LEVEL SCIENTIFIC DISCOVERY

2001: for the first time in the world an outstanding scientific discovery has been registered in Russia.

A method of industrial production of carbon nanostructures (nanotubes and nano rings).

Basis: pure 99,4% carbon, environmentally sound & safe.

Adsorbent name: HIGH-REACTIVITY CARBON MIXTURE (HRCM)

It has unique sorption capacities.

It can be industrially produced in any volume necessary.



HRCM: PROPERTIES & COMPARISON CHARACTERISTICS

Main properties:

- Chemically inert, electroconductive, hydrophobic, reacts stable to hostile environment
- Apparent density – 0,001 g/sm³
- Specific surface area – 2000 m² for 1 gram
- Restitution of absorbed substances – up to 98%
- Working temperature: from -60 °C to + 3000 °C

HRCM compared to US made Barrier-filter:

- Color elimination – 5 times more effective
- Suspended particles – 7 times
- Transparency – 16 times clearer
- Iron – 187 times

Besides

- HRCM can purify hot water and steam
- HRCM regenerates under high temperature burning



HRCM AS A FILTER ADSORBENT FOR POTABLE WATER

HRCM: sorption capacity per liquid phase of combustibles and toxics	
Substance	Sorption capacity: 1 g of HRCM /1 g of substance
Nitric acid	1/50
Acetonitrile	1/45
E-70 gasoline	1/30
Benzene	1/35
Butyl alcohol	1/35
Hexane	1/25
Heptyl (H,DMT)	1/20
Diesel fuel	1/40
Dichloromethane	1/30
Dichloroethane	1/35
Kerosene T1	1/40
Crude petroleum	1/80
Petroleum sediments	1/50
Propylene alcohol	1/30
Vegetable oil	1/45
Sulphuric acid	1/40
Turpentine	1/30
Toluene	1/40
Carbon tetrachloride	1/50
Xylenes	1/40
Light fractions of petroleum	1/30
Oil-based dyes and paints	1/100
Machine oil	1/50
Phosphoric acid	1/70
Chloroform	1/30
Cyclohexanol	1/35
Ethyl benzene	1/35



FIRE CHECKING AND EXTINGUISHING

The HRCM has also been practically tried in fighting flames originated by toxic and combustible substances on both ground and water surfaces



POTENTIAL AREAS FOR HRCM USE

- high quality of potable water after filtering treatment;
- localization and extinguishing of both ground and sea based fires originated by toxics and liquid combustibles;
- liquidation of emergency oil spills of and its derivatives on both ground and sea;
- respective recultivation of soils;
- instant purification of ballast water in tankers and container-ships;
- purification of ground waters from pesticides and other organically dangerous substances in the agricultural sector;
- water retention in sandy and salty soils;
- thermal and rust protection for heating pipelines and boiler machinery;
- purification of industrial sewage water

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Thank you for your attention!

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