

Integrated Enforcement and Planning for Industrial and Municipal Wastes Treatment, based on their Accounting, Sorting, Certification and of the Best Available Technologies (BAT) revealing.

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One of the principal peculiarities of Natural-Anthropogenic Environment (by Legislation of Russia and term "Dovkilja" = Environment in Ukrainian Constitution) is the steady growth of Wastes amount and multiplicity. The Technogenic Sphere and Mankind Vital Activity are the nonstop generators of not-natural improper products — Liquid, Solid, Gaseous and Information Wastes. In the same time into Waste Flows are transforming also purposeful products of Technogenic Sphere (Production, Goods, Provision, Information Medium) after their usage, physical or functional depreciation, damage etc, as well as human and domesticated animals physiological wastes. And in addition we have growth of the "secondary" wastes which are generated by the "primary" wastes treatment.

As opposed to elementary Metabolism (which is a part of Nature processes) these Waste Flows of Mankind activity (so called «Industrial Metabolism») already changed evidently the Substances Circulation both on the Earth and in the nearest Space (Shapskauskas, 1993)

The main amount of Wastes is generated as by-products in the processes of Natural Resources (Water, Air, Soil, Biota, Energy) extraction and transformation into Raw Materials and Energy Wares. The following Waste Generators are Industry, Services, Consumption, Mankind Life Activity. The issue how to minimise whole Life Cycle of our Civilisation became through the last decades an essential part of National and International Legislation:

- Pollution Prevention Act (US, 1990);
- Basle Convention (1992);
- German Law on the Economy of Close Cycle and Safe Waste Disposal (1995);
- Ukrainian Law «On Waste» and CIS Model Law "On Industrial and Consumption Wastes" (1998);
- New Directives of the EU Parliament and Council, as well as the EU Strategy on Raw Materials (2008) etc.

The single means for consequent embodiment of Waste Minimisation Principle, which is proclaimed by mentioned Legislation, is the Evolutional Perfection of Technologies. Under term of "Technology" everybody should understand any Human Activity (Natural Resources Utilisation, Production, Agro-sphere, Services, Consumption, not natural needs satisfaction, e.g. – to be in fashion, etc) ordered and directed for specified result. The main identifier of Technology is transformation of natural and anthropogenic Material, Energy, Biologic and Information Resources. From such point of view it's obvious that all Wastes are generated exactly by the Technologies of Natural Resources Utilisation, Production, Consumption and

Vital Activities (Broyde, 1994). And the evolutional Technology Perfection should be provided through step-by-step implementation of Best Available Technologies (BAT, Cleaner Production, Best Environmental Practice etc.), as well as in a way of their compositions (BCAT) «along» the Life Cycles of Productions, Goods and Services.

It's also ensued that traditional total Wastes Stream division into Industrial Wastes and Municipal Wastes (Manufacturing and Domestic) is coming from crucial technologic difference between these main Waste Flows Generation.

Industrial Wastes are generated immediately in the processes of concrete desired products manufacturing. Therefore the Technology and Materials, which are forming both desired products and simultaneously generating wastes, have predetermine totally their amount, composition, properties etc. (Broyde, 1999).

But in the in Domestic and Municipality Sphere such manufacturing heredity from Waste Generation processes isn't so predetermined. Quantitative and qualitative composition of the Waste Flows generated from kitchens, construction sites, territory cleaning etc aren't so mach determined by the concrete technologies of meal preparing, clearing of rubble and debris, collection of glass, plastics, waste oil, tyres, accumulators or disposal of medical waste.

Mach more this Municipal Waste Flow is pre-determined by the

- Initial Technologies of agricultural and food industry products processing and package, which were produced or brought in the concrete territory,
- Materials and Technologies which were applied for construction and repairing,
- Advertising activity in the area;
- Transportation activity and cars restoration, taking into consideration peculiarities of local vehicles market, actual park and auto-service;
- pharmacology network and medicine publicity;
- touristic business development etc.

By other words the amount and composition of Waste Flows from Consumption (Domestic, Municipal) are predetermined by the Saleable Products Flows which are produced or transferred in the territory, by Trading Technology in the area, by Life Standards and Basket of Goods which composition is specific for each region or city.

So, the efficient Waste Management and Treatment should be provided taking in consideration the “Sum of Manufacturing and Consumption Technologies”, as well as this lump permanent change (Material and Energy Balance assessment) for each concrete territory.

The core sequential objectives are reflected in Ukrainian Law “On Waste”. As solution for this issue has been created the System of Interstate (CIS) Standards ГOCT 17.9. “Environment Protection. Waste Treatment», which was initiated by the Standards:

ГOCT 17.9.0.1-99 (ДCTY 3911-99) Waste detection and submission of information data about waste. General requirements;

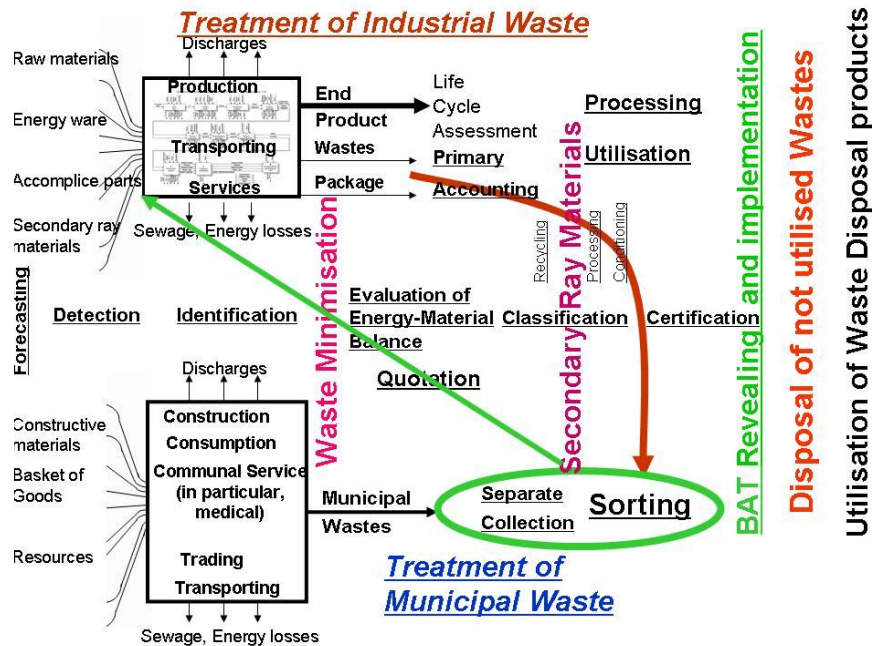
ГOCT 17.9.1.1-99 (ДCTY 3910-99) Waste Classification. Order of waste denomination according to their genesis and their reckon with classification categories;

ГOCT 17.9.0.2-99 (ДCTY 2195-99) Technical certificate of waste. Make-up, content, writing and alteration rules,

For putting this management system into operation it serves now the mechanism of Primary Accounting of Wastes and Package accordingly to Form Nr 1-BT (Broyde 2007), approved by the Order of Ukrainian Ministry of Environment Protection of 07.07.2008 Nr. 342, agreed by the National Committees of Statistics and of Entrepreneurship and registered by the Ukrainian Ministry of Justice.

The key missions for this permanently functioning system are the search, selection and stimulation for BAT implementation (Broyde, 2005) for every Life Cycle in the sphere of Natural Resources utilisation, Production, Goods and Services, Consumption and Waste Treatment.

On the Picture 1 is shown General Scheme of Integrated Management for Industrial and Municipal Waste Flows Treatment on the basis of mentioned Ukrainian and CIS Legislation harmonised with «Acquis Communautaire». It's grounded on 3 main "functions" of the Waste in Natural-Antropogenic Environment (Broyde, 1998):



- just Waste Generation can serve as the main indicator to detect «weak points» in actual Technologies of Life Cycles of «Production – Consumption - Wastes»;
- namely the Waste Flows from Technogenic Sphere and from Natural Resource utilisation are the main negative Environmental Impacts and Risk Factors for Human Health;
- Waste Treatment is the shortest way to minimise Energy & Resource transformations and losses in Technological Cycles, as well as to utilise Energy and Material Resources accumulated (or even concentrated) in the Waste.

Picture 1 General Scheme on Pollution prevention – Waste minimisation – BAT implementation for Industrial & Municipal spheres

Along the central axis of Picture 1 are situated the elements of Integrated Management for Industrial & Municipal Waste Flows Treatment, which are defined by the actual Legislation. / Compulsory Waste and Package Primary Accounting in the sphere of Production and Services in combination with Separate Collection and Sorting of Municipal Wastes. And it allows to establish consistent mechanism for consequent Waste Minimisation on the certain territory (region, city, district).

Municipal Wastes Separate Collection and Sorting per se (even being united by economic links) should range (on the World experience) waste treatment from approximately 1 Mio inhabitants, to provide efficacy and profit for Waste business without essential growth of tariffs for waste transporting, utilisation or disposal.

At the same time even the Production & Service Wastes Certification based on European BAT Reference Documents (BREFs) can't define immediately the individual solution for each kind of Waste Minimisation, Utilisation or Safe Disposal.

Resolution of this problem is possible through integration of Manufacturing & Services Waste Management with Separate Collection and Sorting of Municipal Wastes. Such Symbiosis allows to elaborate united Clustering Strategy for Waste Minimisation on the territory.

The proposed approach includes following opportunities:

1. Sorting Plant can accept those part of not-utilised industrial wastes, which on result of Primary Accounting and Certification is compatible with Municipal Waste Treatment.

2. The Enterprises Technological Facilities data, which are systematised and permanently renewed through Primary Accounting and Certification of their Wastes, allow to use more flexible these Enterprises capacity for the Sorted Wastes processing. They can process and utilise the certain part of Sorted Wastes, instead to build special enterprises, which have to be guaranteed on the amount of wastes for processing, as well as need specific infrastructure, permits etc.

As result the necessity for territory with population of 1 Mio inhabitants decreases to more optimal indexes for typical city or district.

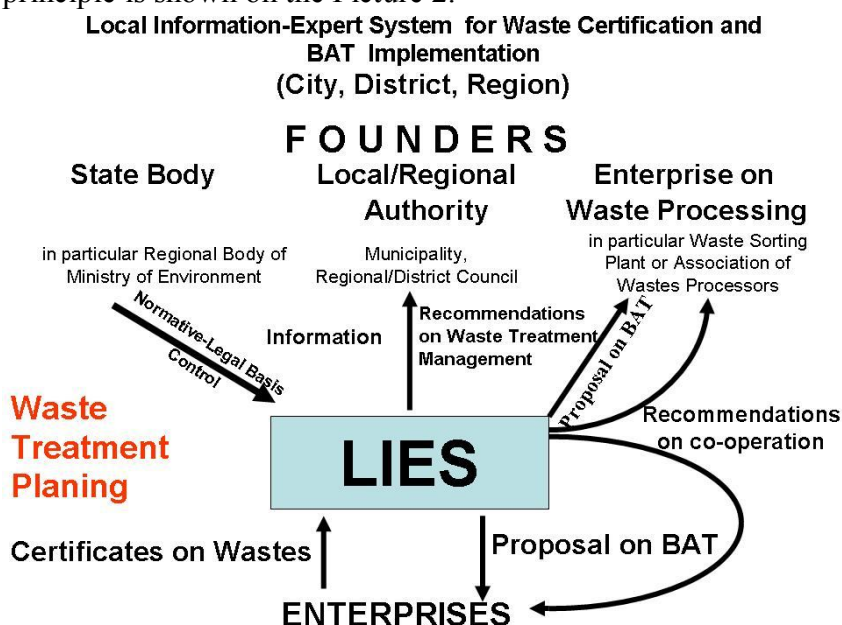
3. Development of common territorial Plans for Waste Flows Treatment. as it foreseen by EU Directives. The means which are planned in such manner for Waste Minimisation should cover whole Life Cycle of Waste Treatment, starting from Waste Forecasting accordingly to GOCT 17.9.0.1-99 and from the Goods Flow entering the territory. These Plans will also foresee the Conditioning of the wastes, which are not utilised for today, to optimise their disposal on dumps for the following available processing, landfill gas and filtrate collection etc.

4. Common approach elaboration for Innovation-Investment policy both in the field of immediate waste treatment and more wide for the “Sum of Technologies” on the territory.

5. Essential improvement of Environmental Monitoring, Risks Foreign and Prevention through implementation of modern Information Technique, Geo-information Systems (GIS) and Distributed Unified Data Bases on flows and amount of Waste in total context of EU IPPC Directive implementation.

Information-analytic systems foreseen by Ukrainian law “On Waste” can serve as a tool for this Clustering approach implementation based on public-private partnership (PPP) between State & Local Authorities and Business. Accordingly to requirements of the mentioned GOCT 17.9 the Information-Expert Systems (IES) have to be created on the Local and Regional level. The main objectives for IES are to provide methodical-information support for Waste Accounting and Certification by the enterprises and institutions, as well as the necessary BATs revealing to Minimise Waste Flows and losses of Energy & Resources and to create in the same way proper Distributed Data Bases in the area.

Preliminary Scheme of such Local IES (LIES) establishment and further functioning under PPP principle is shown on the Picture 2.



Picture 2. Scheme of establishment and operation for Local Information-Expert System on Waste and BAT

As co-founders for such Agency should be public and self-government bodies and business structures, concerned Waste Treatment. At this, each IES party has to agree both common functions proclaimed by actual Norms and the certain services.

Being in contact simultaneously with Waste Generators, Processors and Authorities, LIES has to formulate territorial Waste Treatment Plans in terms of concrete solutions aggregate.

At the same time LIES should provide service and

support for each separate enterprise and for each kind of waste, taking into account mentioned integrated facility of the territory.

This approach embodiment need step-by-step organisational and technical means, as well as systems technological solutions. In technological field the key role will play the flexibility of the whole System of Municipal Wastes Separate Collection & Sorting, which should provide simultaneously:

- putting into operation the necessary capacity for actual Wastes Flow Sorting;
- permanently widening co-operation with actual Waste Processing operators and with other enterprises, which are interested in such activity;
- providing necessary Conditioning for those not-utilising wastes which should be disposed to dumps.

Such approach is targeted at win-win collaboration between municipal/regional communes and developers/producers of the flexible technologies for Waste Sorting, their Energy Resources Recovery, Compression for further Transporting & Processing, Organic Waste Composting and not-utilising wastes compaction for most effective disposal on dumps.

Proposed Strategy for Waste Treatment Integrated Providing and Planning allows to combine principles of National and International adjustment in this sphere with concrete solutions maximal approximation to real facilities and needs of the territorial communities, municipalities and business, involving necessary Technologies and Resources.

List of Sources

Shapskauskas M. (1993). Anthropogenic circuit of substances: In: Proc of XV Mendeleev Congress on General and Applied Chemistry (Minsk - 24-25 May 1993), vol 3, Minsk, P. 399-401.

Broyde Z. (1994). Problems for Standardisation in the field of Environment Protection and optimal Resources Utilisation. *Standards & Quality, Moscow* 4, 29-32 6, 31-36

Broyde Z. (1998) On Standardisation of Environmental management. *Ecotechnologies and Resource Conservation, Kiev*. 1, 27-33

Broyde Z. (1999) Waste Treatment Standardisation. *Ecology and Industry in Russia* 4, 39-43

Broyde Z. The way to Minimisation of Waste: from «end of pipe» toward «Best Available Technology». In: 4th International Congress on Waste Management “WasteTech-2005” Moscow, 31 May – 3 June 2005, Abstracts P.17-18

Broyde Z. (2007). Through Wastes Mimimisation to Innovation-Investment Technologies In: V Int. Congr. on Waste Management & Nature Conserving Technologies WasteTech-2007 — 29.05-01.06.2007 Moscow. P. 67-68