

Dimitry DRANHOUSKI, Valery NESTERENKO
and Sergey DOROZHKO,
Belarussian State Politechnic Academy, Belarus*

**PROBLEMS OF INCREASING THE LEVEL
OF ECOLOGICAL MANAGEMENT AND AUDIT
IN INDUSTRY WITH THE PURPOSE
OF IMPROVEMENT OF THE ECOLOGICAL
SITUATION IN THE BALTIC REGION**

The problem of rational nature management in the Republic of Belarus with its various industries, including chemical and petrochemical, is currently highly important. The industrial complex of the republic includes more than 100 branches. There are more than 1700 large industrial factories in Belarus now. Their activity is connected with various industrial emissions and waste – gaseous, fluid and solid, which pollute the air, rivers and lakes, soil and underground waters.

Table 1 shows data about emissions of pollutants into the atmosphere from stationary sources and transport in Belarus in 1999. It is visible that among the areas of the republic the greatest quantity of pollutants was discharged into atmosphere in the territory of Minsk and the region of Minsk – 398,9 thousand tons. In 1999 industrial factories, objects of power engineering and motor transport in the territory of Belarus discharged into atmosphere 1421,2 thousand tons of pollutants. The majority of this was produced by transport – 1047,0 thousand tons (73,7%). Less than one third of total emissions – 26,3% (374,2 thousand tons) was due to stationary sources.

*Dimitry Dranhouski is a student and Dr. Valery Nesterenko and Sergey Dorozhko are scientists of the Ecology Department of the Belarussian State Polytechnic Academy, 65 Scaryna Avenue, Minsk, 22027, Republic of Belarus. E-mail: nesterenko@ecodept.unibel.by

Fig. 1 shows the composition of pollutant discharges into air on the territory of Belarus in 1999. More than half of the total discharges was carbon dioxide – 55,3%. Sulphur dioxide – 11,5%, nitrogen oxides – 10,0% and hydrocarbons – 17,3% also compounded the considerable scale of discharges.

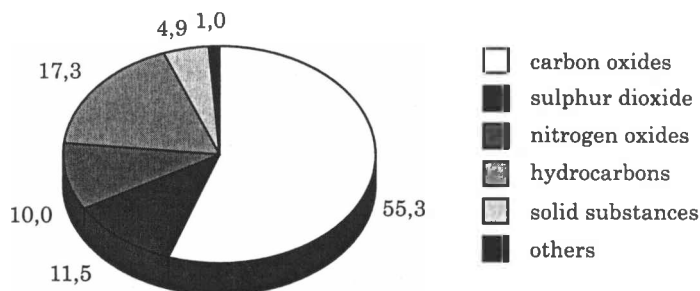


Fig. 1. The composition of pollutant discharges in air on the Belarusian territories in 1999

Fig. 2 shows the dynamics of the level contents of ozone in the atmosphere above the territory of Belarus in 1997–1999. Its decrease is in no small degree connected to the pollution of atmospheric air. The data were obtained as a result of research in the Minsk ozonometrical station and data from satellite observations.

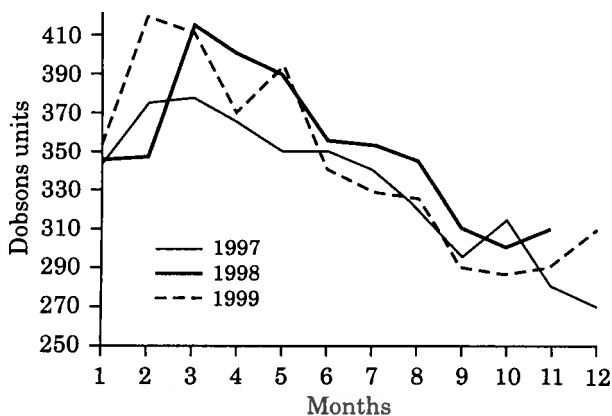


Fig. 2. The dynamics of the general contents of ozone in atmosphere above territory of Belarus in 1997–1999

In 1999 22,4 million tons in total of solid waste were formed on territory of Belarus. The level of their utilisation has increased by 16,7%. The

majority of unused industrial waste was accumulated in factories' polygons-dumps (77,6%), the others were transported to solid domestic waste (SDW) dumps (21,6%) or were left on the factories' territory (0,5%).

Fig. 3 shows the dynamics of the formation and accumulation of storage of industrial waste in 1992–1999 for Belarus in general. Unutilized waste from production and consumption are routed to 80 polygons for industrial waste and the general area of the more than 180 polygons of SDW is 2950 ha. The polygons of SDW cover an area of 815 ha, more than half of which is already filled. The situation of polygons does not correspond to normative requirements and it increases the likelihood of ecological danger in these objects.

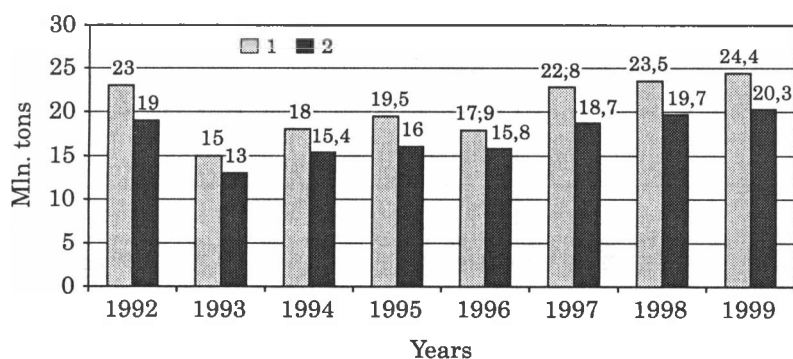


Fig. 3. The dynamics of formation (1) and accumulations (2) in stowage of industrial waste in 1992–1999 for Belarus in general

Inn Belarus there is an acute problem of protection and rational usage of water resources. Annually the Republic of Belarus uses 1,7 billion m^3 of water. The household water supply is about 790 mln. m^3 and industry and agriculture account for the rest. The annual volume of sewage in 1999 has increased by more than 1,3 billion m^3 . 142,0 and 2,0 mln. m^3 of water accordingly were routed onto fields of filtration, different kinds of catchment basins, into underground basins.

Thus, the surface waters on the territory of Belarus show clear chemical pollution, which has resulted in the pollution of the main rivers. The quality of the surface waters of the republic is estimated by using the data from hydrochemical supervision obtained in the stationary hydrochemical network of the State Committee for Hydrometeorology in 1999, including 83 water objects in 106 settlements and 164 points in the basins of Western Dvina, Neman, Western Bug, etc.

The quality of the surface waters of the main rivers of Belarus is established according to the Water Pollution Index (WPI), which consists

Table 1. Data about emissions of pollutants into the atmosphere from stationary sources (S) and transport (T) in Belarus in 1999, th. tons

Region	Sources	Carbon oxide	Sulphur dioxide	Nitrogen oxides	Hydro carbons	Solid substances	Benzo(a) pyrene	Others	Total
Brest	Σ	113.5	19.3	18.0	31.0	12.6		0.7	195.1
	S	8.6	13.1	3.7	2.3	8.0		0.7	36.4
	T	104.9	6.2	14.3	28.7	4.6	125.2	—	158.7
Vitebsk	Σ	112.9	43.0	32.2	53.0	9.9		0.9	251.9
	S	12.5	37.0	18.4	25.5	5.5		0.9	99.8
	T	100.4	6.0	13.8	27.5	4.4	121.8	—	152.1
Gomel	Σ	129.1	35.7	22.2	42.4	9.0		5.3	243.7
	S	17.6	29.7	7.9	12.9	4.6		5.3	78.0
	T	111.5	6.0	14.3	29.5	4.4	127.2	—	165.7
Grodno	Σ	102.5	10.6	17.5	27.0	9.0		1.6	168.2
	S	10.9	5.6	5.6	2.6	5.3		1.6	31.6
	T	91.6	5.0	11.9	24.4	3.7	105.1	—	136.6
Minsk	Σ	239.5	37.9	36.6	58.2	18.1		8.6	398.9
	S	25.5	27.0	10.2	2.7	10.3		8.6	84.3
	T	214.0	10.9	26.4	55.5	7.8	235.5	—	314.7
Mogilev	Σ	88.9	17.0	15.3	24.6	11.2		2.2	163.2
	S	9.9	12.4	4.6	7.1	7.8		2.2	44.1
	T	79.0	4.6	10.7	21.5	3.4	93.7	—	119.1
Republik of Belarus	Σ	786.4	163.7	142.0	245.5	69.8		13.8	1421.2
	S	85.0	124.9	50.5	58.4	41.6		13.8	374.2
	T	701.4	38.8	91.5	187.1	28.2	808.5	—	1047.0

of 7 classes of polluted waters, is shown in Fig. 4. According to the WPI, the water of an absolute majority of the rivers of the Baltic Sea basin can be categorised as moderately contaminated, and the river Svisloch – to rather contaminated.

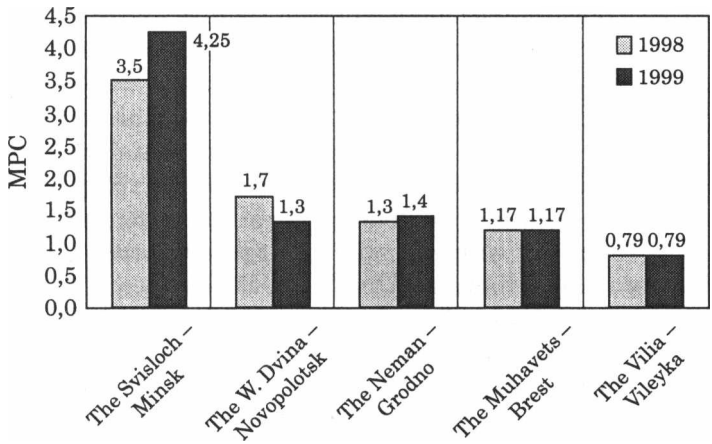


Fig. 4. The quality of surface waters of the main rivers of Belarus is established according to the Water Pollution Index (WPI)

As an example, Fig. 5 shows the level of contamination (as a ratio to the Maximum Permissible Concentration (MPC) of the rivers of the Baltic basin by petroleum.

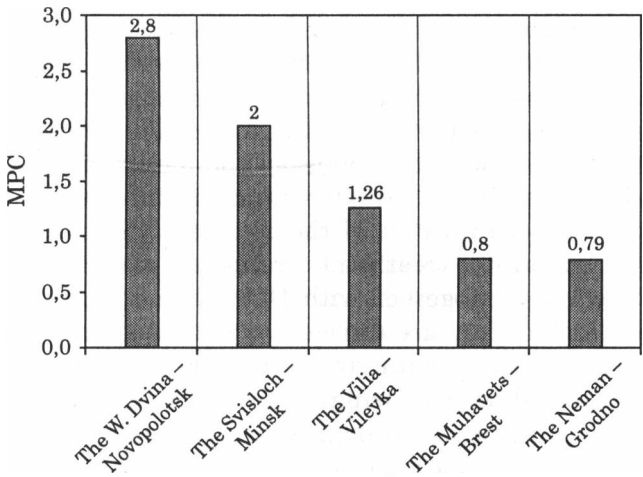


Fig. 5. The level of contamination (as a ratio to the Maximum Permissible Concentration (MPC), of the rivers of the Baltic basin by petroleum

The data from radiation monitoring of the Belarusian rivers (1987–1999) have allowed the calculation of the contents of radionuclides in the rivers of Belarus (of cesium-137 and strontium-90). The data analysis for this term has shown that the concentration of radionuclides in the rivers considered has considerably decreased since 1987, but still remains above the levels before the Chernobyl catastrophe. There is still an acute problem of the quality of underground waters, which is strongly connected to the general pollution of the environment.

The Republic of Belarus is one of 14 countries, which are situated in the drainage basin of the Baltic Sea. So environmental protection in the Republic of Belarus is very important for the Baltic Region. In connection with this, the Republic of Belarus constantly maintains close relations with the following international intergovernmental organizations: the UN Environment Program (UNEP), UN European Economic Commission (EEC on problems of environment and water resources), Development Program of the United Nations (DP UN), World Meteorology Organization (WMO), World Health Organization (WHO), World Bank (IBRR), Organisation on Economic Co-operation and Development (OECP), Commission of European Community, Program TACIS of European Assemblage, Intergovernmental Ecological Board (IEB), organisations founded to implement of the international nature protection conventions and their protocols, etc. The Republic of Belarus was selected for the 52nd Session of the General Assembly of the United Nations in Control Advice UNEP for a four years term, starting in January 1998.

The Republic of Belarus is carrying out work on the establishment of direct bilateral relationships in the sphere of environmental protection with the Commonwealth of Independent States (CIS) and with such states as Germany, Switzerland and Sweden. Belarus signed intergovernmental agreements with Latvia, Russia, the Ukraine and also interdepartmental agreements with Poland, Denmark, Moldova, Lithuania, Bulgaria and Slovakia. Co-operation between the nature protection offices of Belarus and Denmark is carried out within the framework of the agreements signed in 1994. Priorities of the co-operation are water resources protection and wastewater treatment, processing of dangerous waste, etc. Projects are carried out together with Danish Environmental Protection Agency. In particular, they are directed to reducing emissions from local source pollution along the main rivers running into the Baltic Sea, and they are also directed to increasing protection of the atmosphere.

Three general educational student courses in the program of the Baltic University also have such an aim. These courses are studied at the Ecology Department of the Belarusian State Polytechnic Academy (BSPA) and are oriented towards regional problems. They are «Environ-

ment of the Baltic Sea Region», «Peoples of the Baltic», and «Sustainable development of the Baltic Region». Particular, the course «Sustainable development of the Baltic Region» deals with the problems of the creation of a sustainable society in the Baltic Region, problems of sustainable natural resources use and management, long-term environmental protection and the organization of the sustainable development of society. The education course «Sustainable water management» is for more specialised and detailed training. This course is a continuation of the previous courses and is intended for students, specialised in Hydrology, Geology, Physical Geography, Agronomy, Agrology, Forestry and Environmental Protection. The main purposes of the course are to give professional knowledge in the field of water resources in the Baltic Region, their modern usage and control, and also to teach principles of rational water usage with allowance for the best models built for local and national specifics.

The Ecology Department of BSPA carries out engineer training for the speciality «Ecological management and audit in industry». According to the educational schedules the 3rd to 5th year students carry out research work on the speciality under the direction of an attached teacher. The topic of one of these research projects is «Finding organizational and technological measures to reduce the harmful effect of mechanical engineering factories on the environment» – based on an example of a Minsk heating equipment plant. This factory is one of the branches of industry that negatively effects objects of the environment, polluting the atmosphere, hydrosphere and soil. Naturally, the optimal choice and realization of nature protection measures can promote, together with a more rational usage of natural resources, considerable reduction in environmental pollution and that contributes to the solution of the ecological problems posed by the given type of factories.

In connection with this, the problems related to an increase in the level of ecological management and audit in industry are currently important. In industrially developed countries the basic achievements in environmental protection activity (first of all at the factory level) are the development of ecological audit and ecological management. One of the important features of ecological audit is the analysis of the gathered data demonstrating the strong and weak parties of an ecological management system for factories and the reliability of methods of ecological monitoring. It is important to rely on the conventional standards – MPC standards, WHO and regional standards.

An optimal development trend of commercial production consists of the following: complex usage of raw materials on the basis of broad application low-waste and non-waste technology processes with utilization

of industrial and domestic waste, reduction of toxic emissions, clearing of sewage with their subsequent usage and creation of the scientific bases for technologies making use of recycling. During the complex processing of raw materials many kinds of industrial waste become a source of raw materials for producing a lot of useful products. Any activity resulting in a relative reduction of water consumption in production, and also in the application of different sewage purification methods taking into account a factory's structure has large significance for the protection of natural waters. Transition to a system without sewage, perfecting of "know-how" is one of the most effective ways of achieving considerable economies of reserves of clear water.

Implementation of indispensable measures on the protection of the Baltic Sea basin is being realized. The stopping of pouring out unclear sewage into the rivers and other pools of the Baltic Sea basin concerns a number of main measures. The largest industrial centres of Belarus (Vitebsk, Grodno, Brest, Novopolotsk, etc.) are on banks of many ground-water arteries.

One of major problems of modern industrial production is the re-use of technological waste in economic circulation. Any advantage of the usage of secondary raw materials does not limit only by economies of primary raw materials. The practice demonstrates, that re-use of raw materials is aimed at reducing negative influences on the environment. Until recently, factories preferred using even rather poor primary raw materials than good waste, as the technology of processing, as a rule, is adapted to primary, instead of secondary raw materials. Therefore it is necessary to stimulate creation of new technologies for the complex usage of raw materials, that the waste becomes transformed into to production and produce a profit for factories.

Thus, the new methods, based on an increase in the effectiveness of production by complex usage of both raw materials and non-waste technology processes, are necessary for the successful solution of problems of an environmental protection in industry.

A particularly important role in ecological management is played by economical levers in the field of nature management, which are: the planning and financing of nature protection activities; preferential crediting of nature protection activities; definition of limits on natural resources usage and arrangement of waste, permissible emissions (sewage) of pollutants into the environment; taxes and other payments for natural resources, using emissions (sewage) of pollutants in environmentally friendly ways, arrangement of waste; punishing those who harm the environment, etc. A clear definition of problems is needed for an improvement in the quality of environmental audit, discussion of the purposes of

audit, the roles of groups of participants and the responsibilities are all important. In connection with this ecological audit can become a reliable indicator on the route of combining high ecological indexes and competitiveness of factories. These approaches have one general purpose – the fulfilment of the nature protection laws by the conforming factories and reliable management of environmental protection.

Literature

- Nesterenko, V., P., *An Industry of Belarus and Problems of Environmental Protection*, Minsk, 1998.
- Condition of the Environment of Belarus: the Ecological Report*, Minsk, Minsktipproect, 2000.