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INTRODUCTION OF EDUCATIONAL TECHNOLOGY IN THE MANAGEMENT OF MUNICIPAL SOLID WASTE

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Abstract

A brief analysis of well-founded ecological, economic and technological policy in solution of the training problem in the field of solid household waste management (SHW) is given.

Specifics of methodology of educational activities when training specialists in the system of solid household waste management is stated.

It has been identified that establishment of a new industry is impossible without professional training of specialists understanding the problem and methods of SHW treatment, ready to develop new equipment and technologies, capable to learn on the mistakes made in this field due to unprofessional actions.

Keywords: Management, solid household waste. Educational technologies

Introduction;

Due to a global trend of recent years to focus on minimization of harmful environmental impact, many countries use resource efficient and low waste technologies. In this process, improvement of waste treatment is a powerful means of positive impact on state of environment.

Today in Russia waste is mainly collected for landfilling, but it results in alienation of free territories in suburban areas and limits use of urban

territories for construction of residential buildings. Besides, combined landfilling of different types of waste may result in generation of hazardous compounds. In 2013, the President of Russia Vladimir Putin called the current situation with waste in the country "nearly critical" [1].

Waste is products generated as accessory, useless or undesired ones in human vital processes and subject to recycling, reclamation or landfilling.

Solid household waste (SHW) is a kind of consumer waste: overage goods and articles, containers and package, foodstuffs unneeded to people or their residuals, generated by population, entities and governmental agencies, in housing and utilities, municipal facilities, in consumer goods and services, as well as similar waste in any other scope of activities, generation of which is not related to manufacture of products and energy generation.

Compositionally SHW is a mixture of components various in their properties, granularity and hazard level.

Although the amount of generated SHW is much lower that industrial waste (the majority of the latter is generated in mining, metallurgical and coal industry, i.e. mainly in one-factory towns), the SHW problem requires highest attention. For many reasons SHW problem has become the global problem of 21 century:

- it affects all towns without exclusion;
- every person in involved in generation of SHW (measured in tons);
- SHW required large areas (SHW density is many times less than that of industrial ones), the resource of active SHW landfilling facilities around towns is limited, and opening new facilities is very problematic (especially in Moscow region and towns of resort zone);
- a civilized solution of the SHW problem (is it related to as low as possible reduction of waste stream to landfilling and burning) is a vote of trust of population to the authorities.

Research objectives, methodology and stages

In our work, we focus on reasoned search of alternative ways of further development of SHW management, based on higher complementarity of material and intellectual / human capital. According to A.I. Nazarov [11] «employment in waste management and their reclamation will grow due to growth of waste volume, caused by growth of population and income, though there are significant problems in this sector related to absence of worthy workplaces. Disposal in all its kinds ensures employment to 12 mln people in just three countries (Brazil, China and the United States). [10] Sorting and processing of reclaimed materials provide 10 times more jobs per a single ton,

than waste landfilling or its burning. In the context of growing investments in SHW management sector [10] the forecast growth of jobs in waste reclamation sector grows by 10% as compared to current trends. However there is something more important that the additional employment potential in management.

To prepare specialists of a new breed in solid waste management, Moscow Institute of Steel and Alloys, and Russian University of Tourism and Service possess twelve-year experience of educational activities.

Discussion of the research outcomes

In the leading EU countries, the volume of landfilled SHW steadily declines and equals in early XXI century (in % of total volume of generated SHW): in France – 36, in Austria – 18, in Germany – 15, in Belgium – 9, in Denmark – 5, in Netherland – 2 (Eurostat data) (fig. 1). In two countries – Russia and Romania – quantitative indicators of SHW treatment showed practically no changes in the last century: 97-98% of generated SHW is landfilled.

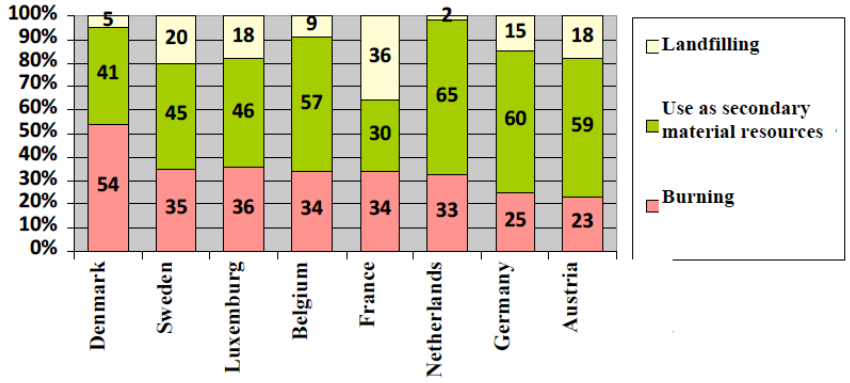

Fig. 1. Balance of SHW flows in the leading EU countries

Main reasons of the situation in 2015 in Russia in SHW management are as follows:

- extreme lack of specialists in SHW management (from a modern perspective, SHW management is a process technology including systematically related operations of its collection, removal, sorting, processing, reclamation and landfilling);

- absence of political will to solve SHW problems in a civilized way;
- absence of scientifically grounded action plan to solve SHW problem (it does not allow identification of most efficient investment patterns in solving SHW problem and pursue a reasonable investment policy, it leaves a wide room for opportunistic policy, crime and corruption).

SHW problem is an interdependent ecological, economic and technological problem. Present day principles of solving SHW problem are based on implementation of combinative technological solutions, comprehensive SHW management based on criteria of ecological safety, resource and energy saving. Excessive simplification of the SHW problem, when its solution is associated with use of a certain selected technology (e.g., burning) may do a lot of harm.

It is obvious that pursuing scientifically grounded ecological, economic and technological policy when solving the SHW problem and establishing a new industry branch is impossible without professional training of specialists understanding the problem and present-day methods of SHW treatment, ready to develop new equipment and technologies, capable to learn on the mistakes made in this field due to unprofessional actions.

Education in this sphere, unfortunately, lags behind requirements of real life: today no university in the country prepares specialists in this profession. It has a negative impact on both country as a whole and the local government. Having no relevant organizational and human potential in their structures, they often become hostages of services provided by foreign and domestic companies, which do not understand the problem property, technologically inadequate, but striving to occupy a segment in the system of SHW management in Russian towns (town sanitation and cleaning service is a sub-branch of housing and public utilities).

The analysis shows that in many educational institutions the SHW problem is handled only within general environmental courses, and specialization on waste treatment issues takes place only at the stage of working over the qualifying paper. General environmental training of students as future specialists is necessary and important, but it is insufficient for running practical activities in SHW management to take scientifically grounded decisions in shaping a new economy sector. General environmental training of students does not provide sufficient technological knowledge in SHW management.

One of the main operations in the general pattern of SHW management is processing, which is realized using dozens of technologies (fig. 2). However, its efficiency depends in many ways on technological solutions at each of the foregoing SHW management stages. To become a specialist in this sphere one

should possess profound knowledge in disciplines based on capturing and critical analysis of global experience, trends in global practice development.

Discussion of the research outcomes

Among the lines of possible use of scientific and technological potential of Russian and EU school of sciences to develop waste treatment sphere the following should be mentioned.

1. Professional development of government officials involved in issues of waste treatment, managers of waste collection, transportation and reclamation enterprises. For example, Swedish company SWECO, focused on consulting services in power supply, water supply and disposal, and solid waste management, offers similar courses for a number of years. The traineeship is funded by Swedish International Development Agency. Swedish specialists offer "Solid Waste Management International Training Program" to representatives of Russia, Ukraine, Georgia, Armenia, Azerbaijan, Moldova, Uzbekistan and Kyrgyzstan.

2. Preparation of good branch specialists based on the system of higher professional education allows shaping scientific and human potential for the waste treatment branch, establishing a harmonic system of governmental and branch management of this field of activities.

Analysis of foreign training programs and domestic experience of implementing educational technologies allows distinguishing the following specifics of educational activity in preparation of SHW management specialists [2-7]:

- all technological aspects of waste management shall be assessed in terms of ecology, economy, resource and energy saving;
- all elements of managed system (collection, removal, sorting, recycling, reclamation and landfilling) shall be considered as a single complex;
- fundamental description of technological basics to solve the waste problem shall take account of the priority of waste reclamation over its landfilling based on realization of hierarchic sequence of waste management.

Training of students in the university should focus on advanced study of technological and ecological solutions of the SHW problem, parallel solution of utility waste reclamation issues and use of unconventional energy sources (minimizing costs of realizing technological and ecological solutions).

The students training program should be comprehensive and include the whole range of issues related to modern priority engineering approaches used in global practice when solving the waste problem minimizing costs and ecological risk of practical activities.

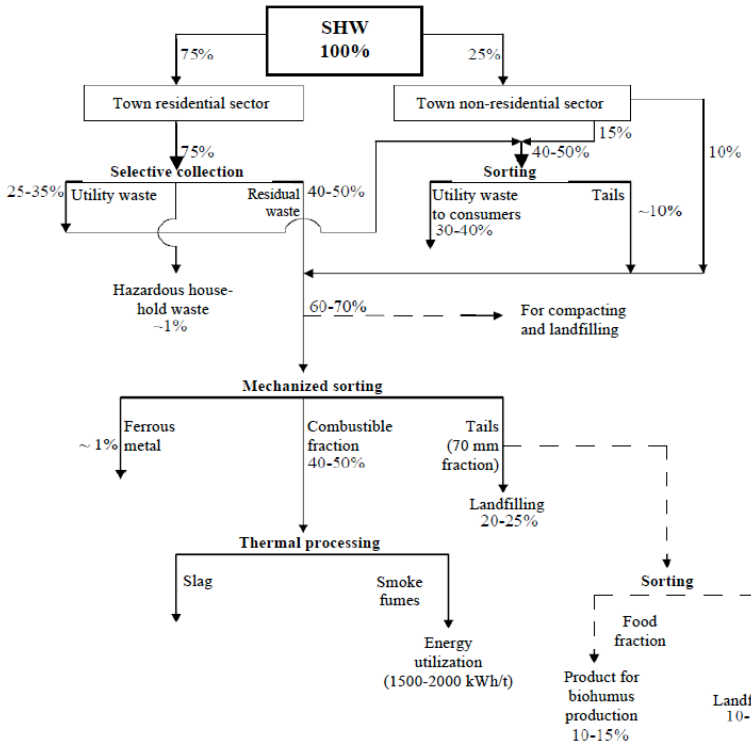

Fig. 2. A flow diagram of comprehensive SHW management by criteria of environmental safety, resource and energy saving

Of course, realization of educational programs should be based on using authentic tra Town residential sector ınce materials (Town non-residential sector trainings, as well as video-films), which are developed, but not demanded for in Russia [8].

The system of sanitation and cleaning of Russian towns from SHW is in stagnation and does not meet present day requirements. Specialists of a new breed are required to improve the situation in the waste management system.

Students of SHW course should closely study waste processing technologies, including such processes as enrichment, thermal, and biothermal technologies.

Thermal processing

Conclusion

Generation of scientific and human potential of waste handling and disposal industry, resulting in a harmonic system of state and branch management in this sphere.

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