THE RECYCLING TECHNOLOGY – TREND AND CHALLENGE FOR NON-WASTE TECHNOLOGIES

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ABSTRACT. In a world that's continuously moving forward, everyone is working to create the next up-and-coming product with long life. Beyond cars and gadgets, the race for the greatest new technology is a constant challenge in the recycling industry. Many enterprises, companies, scientists, and environmental groups are working to construct better recycling processes and machines, as well as create new systems for previously non-recyclable materials. In the Balkan countries, recycling technology is a new direction in decision of obtaining new possibility for better future using secondary materials and other raw materials. In this paper will be present current and recent activities for recycling technology.

Keywords: biomass, pellets, recycling, waste, mining waste, medical waste

INTRODUCTION

Major problems and constraints in the field of waste management in Macedonia are present in almost all areas of the existing system of waste management, as in all relationships in society concerning waste management, legal framework, organization of institutions and human resources, coverage of costs and financing of services and investment, awareness of stakeholders and informing them of all phases of technical management from collection to disposal of waste, the existence of environmental burdens, the impacts on human health and the environment environment with potential impact on the Macedonian economy.

Development of the Republic of Macedonia towards sustainable waste management will require further harmonization of domestic legislation with the EU, institutional changes and large changes in the general practice of waste management. Successful changes in waste management can initiate government by setting specific strategic goals and practice of modern waste management, taking into account existing damage to the environment and the use of its legislative and regulatory power, but ultimate success in practice can be achieved only if all representatives of society understand the relationship between improper waste management and negative effects on the environment and human health, if you become aware of their responsibilities, duties and tasks in the field of waste management if they are motivated organizational and even more with economic measures.

Waste definition and classification-genesis of solid waste associated with the earliest period of human activities. Solid waste is a direct product of human existence, whether he lives alone or in community (rural or urban). The process of urbanization and industrialization affect the rising problem of collection and disposal of solid waste. Therefore this problem is an important and complex tasks within the communal activities.

The adequate solution of this task depends on human health and environmental protection. Population growth, urbanization and industrialization lead to an increase in the amount of waste. Besides the quantitative change, comes to the qualitative change of solid waste. All this gives rise to the surface that are disposed waste. The increase of solid waste represents one of the important issues of our time and from environmental, sanitary and epidemiological, technological, urban, hydrological, construction, energy and others. Under the solid waste means waste generated as a result of everyday human life and work, and waste generated on open surfaces. Solid waste represents a complex heterogeneous material, which under normal conditions is hard. It may be of natural origin such as leaves, snow, fallen branches etc.

The basic composition of solid waste can be: organic, with rapid period of decay (food, animals, waste vegetable oil); waste (organic or inorganic, which have a long period of delay). Depending on the place of creation and the properties of the waste, the waste can be classified into the following categories: Municipal solid waste is waste generated in daily life is housing, dvornite, business premises and land (waste from households, waste food, vegetable, fruit and other crops, paper towels, scrap wood, plastic, rubber, metal and other waste).

This waste can be further classified in several ways. The usual classification is in the following categories: Food waste, paper, glass and ceramics, metals, plastics, rubber and leather, textiles, stones and ashes, garden waste technological (industrial) waste is waste that results from production processes in industry and in institutions, and its abundance of composition and properties differ from municipal wastes. There is little similarity in the type of waste is thrown out of different industries. Forecasting the quantity of industrial waste is harder to predict than municipal wastes. Mining waste which is produced by extractive operations, is operations that are involved in the processing of mineral raw materials are one of the largest generators of hazardous waste. Improper disposal of mining waste pose a major threat to the environment and man.

Biomass is part of the product, waste and residues from agricultural crops (vegetable and animal origin), forestry and related industries. Energy from biomass comes in solid and liquid state (e.g. Biodiesel, bioethanol, biometanol) and gaseous state (eg. Biogas, gas from biomass and landfill gas). Biomass is a renewable source of energy that can be distinguished:

Wooden biomass (forestry residues, waste wood), grown wooden table (trees that grow quickly), biomass (algae and grasses), debris and waste from agriculture, animal wastes and residues, urban and industrial waste. The main advantage of using biomass as energy source is that it is a great potential, both in planted crops, waste materials in agriculture and in food industry. Gases that are produced by the use of biomass can be used in the production of energy. The advantage of biomass compared to fossil fuels is incomparably low emissions and waste. It is believed that the burden of the atmosphere with CO_2 in the use of biomass as fuel is negligible because the amount of CO_2 emitted during combustion is equal to the amount of CO_2 absorbed during the growth of plants if natural growth and harvesting of timber in sustainable ratio of forest areas annually absorb equal amounts of CO_2 that are released by burning 88,000 gallons of fuel to households or 134 000 m^3 natural gas. Agricultural waste are available for cultivation: crops (straw: wheat, barley, oats, rye, etc.), Corn (leaf, stem and cob), rice (straw and husks which make up over 25% of the weight of rice), vegetable plants (beans, peas, potatoes, peppers, tomato, watermelon, onion, cabbage, cucumbers, etc.), industrial plants (sugar beet, sugar cane, sunflower, cotton, tobacco, poppy, etc.) feed plants (clover, alfalfa, fodder beet, etc.) waste from pruning of fruit (apples, plums, pears, cherries, peaches, cherries, nuts, etc.). and vineyards.

The general waste biomass from agriculture and ranching

Many wastes from livestock (domestic animals) that can be used to obtain bioenergy. The most common source of bioenergy is getting manure from domestic livestock such as cattle, horses, pigs, sheep and poultry and dry waste from domestic livestock and poultry. The current practice of agricultural land is these wastes to be buried in the country with plowing the surface, or burnt directly to let yourself fall apart or be done of livestock. Most studies on agriculture and biomass, however, showed that as much of ovoid bins to separate and use for energy. Biomass is the oldest known source of renewable energy used by man thousands of years, is since the invention of fire today. Renewable (sustainable) source of energy for its creation was to-and unlimited can be grown in unlimited quantities in a relatively short time. Biomass has a heterogeneous and complex chemical composition. Energy value of biomass from plants derived from solar energy through the famous process of photosynthesis. Chemical energy accumulated in plants and animals (which feed on plants), or into the garbage they produce is called bioenergy.

The combustion as a process of conversion of biomass heat energy is released and re-oxidized carbon in carbon dioxide to replace the

one that is absorbed while the plants grow. As a result, the use of bioenergy can play a dual role in reducing the gases causing the greenhouse effect.

Biodiesel is a mixture of fatty acid esters obtained from alkaline vegetable oils, animal fats or recycled oils. Biodiesel can be used as fuel in passenger cars as clean, but usually used as an additive in diesel oil in order to reduce the level of particulates, carbon monoxide, and toxic substances CH of cars driven by diesel oil. Biodiesel can be commercially produced from a number of oils and fats such as:

There are two basic types of vegetable oils as feedstock for biodiesel and getting it: intact oil as raw material obtained from: almond oil, walnut oil, oil from flowers, olives, ricin's oil, rapeseed oil, soybean oil, pumpkin oil linen and others. Oils from rapeseed and soybeans typically commonly used as raw material for obtaining biodiesel. –Vegetable crops, such as mustard, palm oil, hemp and algae. Recycled oils are usually called:-Waste vegetable oil (waste vegetable oil) recycled cooking oils, frying oils in restaurants and other recycled oils.

The wood pellets are the type of wood fuel. These have got forms of the short cylinders with diameters from 6 – 10 mm and 10 – 30 mm. The net caloric power is 4, 7 – 5,0 kWh / kg (16.9 – 18 MJ/kg). The prize is not directed from the world markets, more acceptable and more appropriately, decreasing the costs of waste refusing, lower ash content and gas emissions. The standardization of the pellets production is a good tool for controlling the quality of the production. As a most important indicator for the pellets quality is their stability and strength which affect by the transport and combustion. For example, Sweden may be mentioned as a state with regulated classification and this one has limited the pellets according to the quality dividing them into three classes. Macedonian pellets from the region of the south-eastern area (Gevgelija, Berovo, Pehcevo, Vinica etc.) are with good quality acceptable for the Macedonian market.

Summary and evaluation of the current state of waste management in Macedonia

The current state of waste management in Macedonia can be characterized as substandard in terms of the financial and human resources, and insufficient and ineffective in terms of monitoring and enforcement of regulations prescribed, resulting in a variety of dysfunctional systems in society. That level of environmental awareness and waste problem in Macedonia is low, in fact people are not aware of the problems resulting from improper management of waste and the negative effects on their health and the environment and nature. People have no awareness of their own responsibility and role as generators of waste. On the other hand, public attitudes may be manifested in strong opposition to any permanent changes in the practice of waste management, such views are relying on management and real concerns, as well as insufficient information and lack of practice for public access information about the importance of properly treating the waste.

The current legislation regarding waste based on the concept of hierarchy in waste management. This means ideally waste should be prevented, while that which cannot be prevented should be re-used, recovered or recycled as little as possible because it is the worst option for the environmental implication of loss of resources. Hierarchy of waste management should be viewed as hard and quickly accessible goal, especially when having in mind that there are different methods of waste treatment that have different impacts on the environment of waste treatment and different impacts on the environment. However the goal of moving towards recycling and recovery of waste represents a move towards hierarchy in waste management and reduced use of landfills.

Prevention of waste generation should take place initially, because reducing waste means reducing the need for its collection and treatment which is correlated with cost and environmental impact. Prevention of waste in terms of use of tangible goods, services in such a way that their production, use, reuse, recycling will result in the least possible waste production.

Most of the municipal solid waste and other collected waste is deposited without pretreatment of municipal landfills such as old tires, car batteries, oil-based automotive components and other wastes. Landfills are working without work permits, without any techniques that apply to landfills and no regular monitoring in terms of environmental impact. Deposition of mixed hazardous and hazardous waste and incineration of municipal waste, waste plastics plant tissues and the open space, represent the most serious risks and consequences for the environment. One third of the existing 51 landfills are classified in the class with the highest risk assessment of their risk in terms of environment and their closure or remediation is a priority.

Hazardous waste generated by the Macedonian mining and manufacturing industries encountered serious problems, waste from certain processes are abandoned, there is little or no information about the history of waste and environmental consequences, the legal legacy in terms the same is unclear. Sixteen major industrial areas and dump the waste is identified as "hot spots" based on the identified environmental impacts and the high potential of danger. In both situations, this is done with little or no involvement and supervision by authorized veterinarians, mainly in an uncontrolled way and far from the required sanitary standards. Development towards sustainable waste management will require further harmonization of domestic legislation with EU policies changes in institutional organization and major changes in the general practice management. Successful changes in waste management can initiate government by setting specific strategic goals and practice of modern waste management, taking into account existing damage to the environment and the use of its legislative and regulatory power, but ultimate success in practice can be achieved only if all representatives of society understand the relationship between improper waste management and negative effects on the environment and human health, if you become aware of their responsibilities, duties and tasks in the field of waste management if they are motivated organizational and even more with economic measures. [3], [4]

Incineration of waste with energy recovery is another option for avoiding landfills. [12], [13] Deposition of waste in landfills is the lowest possible option in waste management, but still the most dominant method used here. A challenge is to reach certain standards in building the landfill be closed and inadequately managed and maintained sites. Accurate and timely data on waste is one of the key elements for long-term prevention of illegal places of disposal of waste. Inadequate information can lead to inappropriate decisions regarding the legislation on waste and the establishment of an inadequate infrastructure for waste management. Municipalities are generally responsible for organizing sisitem effective management of solid waste on their territories, except for hazardous waste, which under legislation is the responsibility of the state. Based on these results, defined is equal to the production of municipal waste per capita in the Republic of Macedonia, which is: 0.7 kg / day for urban areas (which comprises 60% of the total population);0.5 kg / day for rural areas (where live 40% of the total population).

In other words, the annual production of municipal waste in Macedonia is 470.00 tons, 322.00 tons of which are disposed in municipal landfills, and 148.00 tons in rural areas near the settlements.

Tabl. 1 Evaluation on quantities create medical waste in Republic Macedonia

Assessment of quantities produced medical waste in Republic of Macedonia for 2004 year							
Infective		Potentiality toxic		Toxic		Corrosive	
Solid/kg	Liquid /l	Solid/ kg	Liquid /l	Solid/ kg	Liquid /l	Solid/ kg	Liquid /l
Skopje							
114.000	45.000	387.000	66.870		38.890		635
Macedonia total							
380.000	150.000	1.290.000	222.900		129.630		2.120
Drugs -solid phase (tablets, capsules, etc.).(kg)				Drugs liquid phase (infusions, solutions, tc.).(kg)			
2500				2000			

Tabl. 2 Data on hazardous waste generated in the Republic of Macedonia in 2005 year

Type of waste	Total waste/year	Hazardous waste (tons/year)	Hazardous Waste (tons / year)	(%)
Waste from mining	17.246.000	12.700.000	4.546.000	26
Waste from thermal processes	2.090.726	2.015.379	75.347	3.6
Waste from other processing industries	108.877	106.830	2.047	1.9
Total	19.446.603	14.822.209	4.623.394	24

CONCLUSION

Development of the Republic of Macedonia towards sustainable waste management will require further harmonization of domestic legislation with the EU, institutional changes and large changes in the general practice of waste management. Successful changes in waste management can initiate government by setting specific strategic goals and practice of modern waste management, taking into account existing damage to the environment and the use of its legislative and regulatory power. Nevertheless, ultimate success in practice can be achieved only if all representatives of society understand the relationship between waste management and negative effects on the environment and human health.[8], [13]

The characteristics and properties of the biomass as an energetic source are changeable according to the plant type, moisture content and other examples moving to the limits from 10% to 95% for different base. Among the moisture content and energy, the characteristics of the biomass are defined with their physical structure, mass, density and ash content. Using the biomass as a fuel, that means that absorbed CO_2 from the atmosphere at the growth time of the plant. The system is known as the carbon neutral.

The wood pellets are the type of wood fuel consisting fine particles. Usually, these are parallel product in the forest and wood production. The pellets have got a big density I may be produced with very low ash content (lower than 10%) and this is the reason why these pellets combusted with high combustion efficiency. Also, their geometry and small sizes permitted automatic supplying of the burners with very fine adjustment. Their big density permitted their compact stocking and rational transport at the big distances.

REFERENCES

Alan E. Kehju: Geology for Engineers and environmental experts.
Bernd G. Lotermozer: mine-waste characteristics, treatment, and ecological consequences.
Annual amount of waste generated by industry in 2008 in Macedonia.
Annual report of the processed data on environmental quality in 2007.
EUROSTAT: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00109
EEA-European Environment Agency: www.eea.europa.eu/soer/countries/it/soertopic_view?topic=waste
European commission environmental: http://ec.europa.eu/environment/index_en.htm
European commission environmental-Directorate-General Environment: Costs for Municipal waste management in the EU.
European commission environmental: Hazardous waste generation in EEA member countries.
European commission-Directorate-General Environment: Thematic Strategy on the prevention and recycling of waste, 2005th
EU focuses of waste management.
The incineration of waste in Europe: issues and perspectives.
European-waste-management-waste-policy-and-legislation.