

PROBLEMS OF RECYCLING AND REUSING CITY WASTE OF NOVI SAD

Nenad Grba¹, Ivan Posarac², Vesna Keselj³

¹Student, Partizanskih baza 2, 21000 Novi Sad, (381) 21 401-578

²Student, N.O.V. 47/1, 14000 Valjevo, (381) 14 226-791, poske@ptt.yu

³Student, JNA d5, 25000 Sombor, (381) 25 442-425

Abstract

Territory of Novi Sad with its suburbs is highly urban therefore has a large amount of city waste which is possible to rational and economical recycle. For a real picture of possible structure of city waste has been experimentally evaluated. Based on samples, it has been estimate the content of separate waste components in total amount of city waste and it has been performed analytic evaluation of important factors influence in following period. In work possibilities of treatment of single components of city waste are considered in purpose of graining secondary recycling materials, considering present and future quantity in Novi Sad.

Institute of Energy and Process
Engineering Faculty of Technical Science
University of Novi Sad
Trg Dositeja Obradovića 6
21000 Novi Sad, Serbia & Montenegro
Phone: (381) 21-459-981
Fax: (381) 21-350-775
e-mail: poske@ptt.yu

Contact Author: Grba Nenad

Presenting Author: Ivan Posarac, Vesna Keselj

Submittes for Poster Presentation

Introduction

The area of Novi Sad is highly urbanized. Thereupon, the adequate attention to the control of city waste must be present, since the inappropriate waste processing could cause numerous negative consequences in life conditions and population work. At the time, the method of waste processing already has consequences on the environment in terms of soil, water, air pollution and degradation of bigger soil areas. So far, the explorations concerning possibilities of integral control of waste in function of ecological, social and economic goals, present good starting bases for complex resolving of city-waste queries and optimization of effects based on that solutions.

Illustration 1: Landfill in Novi Sad



Methods

Maintaining of municipal hygiene and evacuation of city waste in region of Novi Sad are practiced through collection, transport and disposal of city waste. Waste transport is done by city company named "Cistoca", Novi Sad. The company has 366 permanently employed workers, has 65 vehicles, 58 of which are economic. The vehicles are average 12 years old with the 90% possibility of malfunction. The existing landfill in Novi Sad is located about 6 km north from the centre of the city. The south line of the landfill is about 170 m away from the highway and the west about 430 m away from the Temerin road. The reach of landfill from the nearest quarts is 700 m.

The landfill is located on the land of poor solvency, high salinity, which is adverse for agriculture. The area of the landfill occupies the lowest part of the gutter region "Vrbak" and is partially overflowed by the underground water. The site is of poor mechanical structure and of adverse water-physical quality. In the existing location the waste is daily taken out. In one week's time, about 1802 tons of waste are laid down.

So far, the way of waste collection has degrading effects on the environment. The waste is deposited by spreading and compressing done by bulldozer (Illustration 1) without necessary cover of the inert material, which brings to appearance of unpleasant odour and enables the wind to plunder light waste away from the site.

The existing recovery steps comprise:

- Modulation of the areas by segments
- Recultivation of individual segments by covering the surface with the layer of material
- Building of available service roads
- Routing of the atmosphere water
- Fencing of the landfill complex
- Degazation
- Drainage reception of process water
- Recultivation

Recovery, recultivation and place closure are based on conducting the steps which ensure that the environment and the population's health are preserved.

By successive investing and service placement, we reach the conditions and real expectations that the present solution is compatible with performance and

completion of the work, that is the closure of the existing and construction of new sanitary landfill.

Results

The experimental research showed true quantity and structure of city waste evacuated by the company “Cistoca”. The measurement of total quantities and structure based on the sample was conducted between 22nd and 28th august, 2002. The samples were taken from 39 locations. The locations were chosen so that they represent different types of habitation (locations with mult-story objects, locations with law objects,...). The sample quantities amounted between 616 and 787 kg per day, which is about 0.25% of total daily quantity. The full quantities were ascertained by measuring gross mass of a replete vehicle and neto mass of an empty vehicle after the waste has been layed off.

Figure 1: City waste in landfill, april 2002

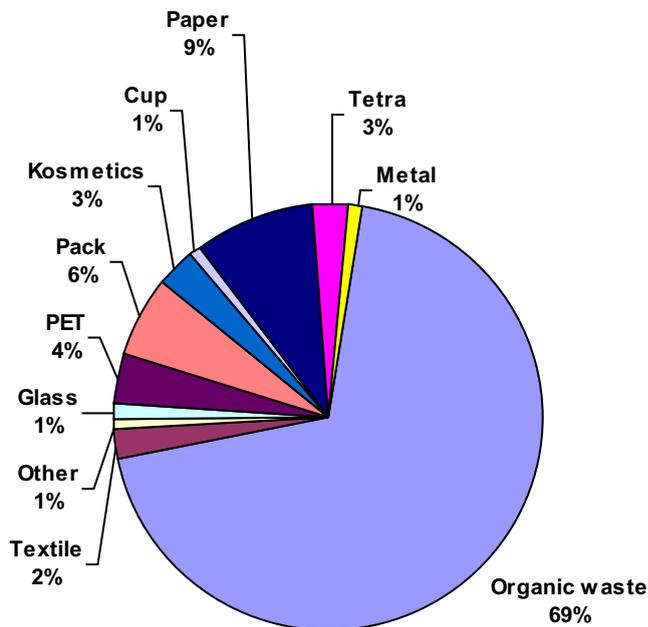


Table 1: Structure of disperse waste volume (22-28. august 2002)

Componetns	22.	23.	24.	25.	26.	27.	28.	Standard	
								kg	%
Paper	80.5	79.1	117.0	123.0	134.0	65.1	84.4	97.6	13.5
Glass	8.5	6.0	21.5	6.5	19.0	4.6	8.3	10.6	1.5
Plastics	106.0	60.5	88.4	100.4	71.3	67.6	90.5	83.5	11.5
Metals	51.0	8.0	8.9	14.0	4.5	7.2	5.8	14.2	1.9
Rubber	24.5	3.5	-	-	-	3.5	-	4.5	0.6
Textile	22.0	4.5	24.0	2.5	10.5	27.0	21.8	16.0	2.2
Organic waste	466.0	506.0	339.5	476.9	523.5	574.4	461.7	478.3	65.8
Other	21.0	22.5	16.5	18.0	24.5	29.0	20.5	21.7	3.0
Sum	779.5	690.1	615.8	741.3	787.3	783.4	693.0	727.2	100.0

In the seven days period, 1802,5 tons of waste have been evacuated, 1542.5 of which from households and 360 tons from other producers of city waste. Standard volume of total waste per day is 272 tons.

Contents of several city waste components were ascertained on the basis of experimental results.

Table 2: Standard day and year volume of several city waste components whose transport in Novi Sad in 2002.

Components	Standard volume in tons		Struktura in %
	Day	Year	
Paper	36.5	13323	13.5
Glass	4.0	1460	1.5
Plastics	21.1	11714	11.5
Metals	5.3	1935	1.9
Rubber	1.7	621	0.6
Textile	5.9	2154	2.2
Organic waste	178.4	65116	65.8
Other	8.1	2957	3.0
Sum	272.0	99280	100.0

Conclusions

Quantity of waste in the cities is increasing and the structure of that waste is becoming more heterogenous. Due to the escalation of waste quantity, the environment, water, soil and air are more polluted.

The system of waste management implies the importance of conditions to minimize the production of waste and to use the contents of waste in the most beneficial way. It also signifies the decrease in volume through the processing, the destruction of neutralization of the dangerous waste and transport of the remainder.

The choice of the ways and methods of recycling and using the material again cannot be made only by logics of the economical situation in the country but also by the reduction in waste quantity, by preservation of the raw materials and energy. The fundamental features of this waste neutralizing method are dealing with the waste in a complete sanitary manner, the abstraction of secondary raw materials, the realization of favourable economical effects and the provision of energy for the needs of plants, by producing the industrial fuel as a recycling side effect.

The appropriate waste-recycling plant consists of all modern methods of waste-processing and it resolves the problems of city pollution in the best way. The evaluation of city waste from Novi Sad and its surrounding settlements in the present provides the maintenance of satisfactory municipal hygiene level. However, the state of equipment for preservation hygiene in municipality requires urgent and large investments so as to secure the existing level of the municipal hygiene in the foreseeable future.

The city obtained certain supplies in the beginning of year 2003. The new bins for selecting paper waste among other sorts of waste have selection are not yet accomplished. The assortment on the places of origination and primary deposition requires investing in provision and placement of recycle bins for a variety of structure components (paper, glass, plastics, metal aso.) according to their sub-classes. Pure components, which can be used as raw materials in recycling industry are obtained through this kind of selection.

The separation in specially built plants entails radical investments in plants for separation, the products of the same often contain other components in minimal quantities and consequently the ability to apply them in recycling industry is decreased. The expenses of raw-materials production using this method are often larger than those needed for producing appropriate natural materials which is a significant limitation for separation of the components is approved, there would be a plant for the selection of city waste built in Novi Sad. In the plant, certain components would be abstracted and primarily processed, and then they would be delivered to the fabrics that use those components in production processes per concrete prices in raw-materials market. The organic waste, which is about two thirds of city waste in the examined area, is the most appropriate for energy production using pyrolytic method and/or for production specific structural materials, or with adequate primary processing.

Acknowledgements

We would like to thank professor M. Miloradov for her great help during the work on this project.

References

- (1) Ilic, R.M. Miletic R.S: Osnovi upravljanja cvrstim otpadom, Institut za ispitivanje materijala, Beograd, Srbija (1998)
- (2) Draskovic B., Spariosu T., Rajkovic Z.: Institucionalni oblici zaštite životne sredine i upravljanje resursima, Institut ekonomskih nauka, Beograd, Srbija (1996)
- (3) Draskovic B.: Ekonomija prirodnog kapitala, Institut ekonomskih nauka, Beograd, Srbija (1998)
- (4) Gereke Z.: Principi ekološkog menadžmenta, Magazine "Direktor" number 4-5, Beograd, Srbija (1995)
- (5) Zbornik radova sa simpozijuma: Tretman gradskog otpada, Beograd, Srbija (1996)
- (6) Zbornik radova: Recikliranje otpadnog materijala i sekundarnih sirovina u funkciji zaštite životne sredine, ITNMS, Beograd, Srbija (1995)
- (7) Analiza prostornih mogućnosti deponovanja otpadaka na području zajednice opština Novi Sad, Zavod za urbanizam, Novi Sad, Srbija (1981)
- (8) Studija o korišćenju komunalnog otpada na području opštine Novi Sad, Zavod za urbanizam, Novi Sad, Srbija (1985)
- (9) Studija: Funkcije i gravitacioni odnosi u mreži naselja Novi Sad, Zavod za urbanizam, Novi Sad, Srbija (1988)
- (10) Tehnološki i ekološki projekt sanacije i unapređenja postojeće deponije otpadnih tvari grada Novog Sada, Smelt, Ljubljana, Slovenija (1989)
- (11) Projekat sanacije, zatvaranja i rekultivacije postojećeg smetlišta u Novom Sadu, MP "Hemko-Beograd", Beograd, Srbija (2000)
- (12) Zakon o zaštiti životne sredine "Sluzbeni glasnik Republike Srbije", broj. 66/91 i 83/92
- (13) Pravilnik o kriterijumima za određivanje lokacije i u rešenje deponija otpadnih materija "Sluzbeni glasnik Republike Srbije", broj. 54/92
- (14) Analiza deponovanja otpadaka na području Novog Sada, JP "Urbanizam", Novi Sad, Srbija (1995).