THE INFLUENCE OF THE STORAGE ACTIVITY OF CITY WASTE IN THE VALEA LUI MIHAI LANDFILL AREA ON UNDERGROUND WATERS

Mintaş Olimpia*, Mintaş Ioan*, Vicaş Gabriela*

* University of Oradea, Faculty of Environmental Protection, Departament of Physics, Chemistry and Informatics, 26 Gen.Magheru Street, Oradea, 410059, Romania, e-mail: gabrielavicas@yahoo.com

Abstract

The purpose of the present study is the appreciation of the underground water quality stage in the landfill to quantify the indicator evolution of quality during time.

In this purpose there were taken samples in considered points significant for the time evolution of the dump.

The results obtained indicate possible damage to groundwater and possible for the surface water too.

Key words: landfill, pollution, soil acidification, heavy metals, monitoring.

INTRODUCTION

The waste dump of the Valea lui Mihai locality has a designed capacity of 40000 mc, the actual stored quantity being estimated at 36 000 mc.

According to HG 349/2005, concerning waste disposal, the deposit is an urban deposit, nonconforming, class b, with a stopping deadline of storage in 2017.

The purpose of the present study is the assessment of quality stage of underground waters in the landfill area (Dalea, 2003).

According to the monitoring results of environment factors is being proposed an ecological reconstruction plan of the site adopting the optimal solution of field capitalization (Vicaş 2011).

The analyze of hydro geological local conditions

Valea lui Mihai city is being placed in the hydrographic basin of the Ierului (Posea, 1997).

In Someş plain are being imposed 4 principal collectors (Some□, Crasna, Turul and Ierul) at which is being added Barcău, from the exterior, for the waters from Câmpia Buduslăului, as well as the for the category of little creeks, allochthonous or others from the left of Ier that come from the frame of hills and dry often (Atlas cadastral, 2000).

It springs from the frame hills, flowing parallel and closer to Crasna, until Acâş, where it gets waters from this river through a short channel and flows in Barcău.

His tributaries are: Chechețul, Santăul, Sărvăzel, Sânmiclăuş, Ierul cold, Râtul, Salcia, Ierul narrow.

Ierul had a vague course of low plain, with tens of swamps and ponds and today it is a collector channel.

Its floating surface reached 43000 ha but through the sewerage work and making drains these surfaces entered in the agricultural circuit (Gâştescu, 2009).

It has a flow of 2,24 mc/s, its maximum value of 64,7 mc/s and the minimum of 0,02 mc/s.

The medium specific flow is of about 3-5 l/s/km^2; the maximum value of 400 l/s/km^2 and the minimum of 1 l/s/km^2.

The hydro graphic configuration of the city is being dominated by many streams, including the most important Mouca and Salcia (Left Tributary Ier). The total length of water course is 14 km.

In Valea lui Mihai field the phreatic waters come down to 5-20 m. The underground water is being found at variable depths along city area. So in the central area the phreatic water was found at 2.5 m depth, and in the station area at 3 m depth.

In the rainy periods the level of underground water reaches 0.81 m to 1.00 m. In depth the water is being found at area of 200 m exploitable.

According to hydro geological study made in 2005, the flowing direction of phreatic water in the area of the site is at north-east to south-west.

The activity of storing waste in the described perimeter induces a series of modifications in what concerns dynamic and quality indicators of underground waters.

Inside the active landfill, cannot speak of the soil presence in the soil and geochemical meaning of the term, at least at the surface layer. Through successive depositing of inorganic wastes, oily and biodegradable organic materials, the composition of the first layers was altered to increase the pollutant content(Călinoiu,2006).

Small and medium depth drilling one revealed that natural litho-logic sequence, consisting in compacted clay and different sands was modified by type uncontrolled depositing of urban and industrial waste over the years. This led to the formation of a filling layer of anthropogenic origin, porous consistency, and with relatively high permeability (Consiliul Judetean Bihor).

In the deposit are being storaged the next types of waste: organic waste 68%, textile waste 5%, plastic materials 10%, paper 5% and others 12%.

In present the dangerous waste as part of the household waste and assimilable waste from the household waste (HG 856, 2002) are not separately colected.

Since the metal content of domestic waste and other types of wastes that fall into the category of urban waste is about 4%, it is expected that some of these metals to be included in the composition of the soil, subsoil and groundwater(Sabău C., Domuța C., Berchez O., 2002).

Generating leachate from municipal nonconforming deposits represents one of the principal polution mechanisms of surface and underground waters (Wehry, 2000).

So the meteoric waters that fall on the surface of the deposits are infiltrating in waste, come into contact and dissolve compounds coming from aerobe and anaerobe fermentation of waste of organic nature, and transform in leachate and infiltrate in the soil and subsoil of deposits (Barloy, 1993).

MATERIAL AND METHODS

To obtain information about underground water there were taken sample water from the existant observation drilling on the field (SR ISO 5667-11 :2000 The Quality of water and sampling part 11: General Guide for Sampling Underground Water and SR EN ISO 5667-3 : 2004 The Quality of Water .Sampling. Part 3: Preserving Guide and Manipulating Water Samples).

Drilling F1- depth 12 m, situated at the south-west part outside dump
Drilling F2- depth 11m, situated outside dump in north east of the deposit
Drilling F3- depth 11m situated in the north east dump.

There were analyzed 26 parameters: pH, Conductivity, disolved Oxygen, Total suspensions, Fixed Residue, CCOCr, CBO5, NH_4, NO_2, NO_3, P total, Ca, Mg, Na, K, SO_4, Fe, CrVI, Cr total, Cu, Ni, Pb, Zn, S/H_2S, hydrocarbon tanker (Mănescu, 1994).

The results are being presented in table 1

Table 1

Quality Indicator	UM	Value			CMA, cf. 458/2002,311/2004
		F1	F2	F3	
pH		6,92	7,29	7,25	6,5-9,5
Conductivity	µS/cm	944	1800	1294	2500 µS/cm
Oxygen disolved	mgO_2/l	5,7	7,5	2,0	Min 6
Total Suspensions	mg/l	7	86	69	-
Fixed Residue	mg/l	715	985	981	1200
CCOCr	mgO_2/l	12	18	18	5 mg/l
CBO5	mgO_2/l	1,0	2,5	1,5	-
NH_4	mg/l	0,97	0,61	2,06	0,5 mg/l
NO_2	mg/l	0,08	0,03	0,05	0,5 mg/l
NO_3	mg/l	2,03	<0,40	<0,40	50 mg/l
P total	mg/l	>0,013	0,04	0,15	-
Ca	mg/l	139,2	53,7	121,4	-
Mg	mg/l	33,0	43,3	35,7	-
Na	mg/l	18	172,5	107,5	200 mg/l
K	mg/l	>0,6	3,8	2,5	-
SO_4	mg/l	54,1	62,3	11,9	250 mg/l
Fe	µg/l	0,71	0,87	1,0	200 µg/l
CrVI	µg/l	<0,50	<0,50	<0,50	0,05 µg/l
Cr total	µg/l	<0,6	2,5	1,1	50 µg/l
Cu	µg/l	1,2	122,6	4,6	0,1 mg/l
Ni	µg/l	<1,5	2,6	2,5	20 µg/l
Pb	µg/l	<0,1	19,8	36,5	10 µg/l
Zn	µg/l	<0,10	87	48	5000 µg/l
S/H_2S	mg/l	<2/<0,78	<2/<0,46	<2/<0,46	100 µg/l
Hydrocarbon tanker (UV)	µg/l	<0,25	<0,25	<0,25	-

The obtained values were compared with CMA imposed by law no.458/2002, concerning the quality of potable water, respective with law no.311/2004 concerning the modification and completion of law no. 458/2002.

RESULTS AND DISCUSSIONS

Analyzing the obtained values we remarked :

1. CCO-Cr indicator presents exceeds as it follows:
   - of 2.4 times in the case of sample F1;
   - of 3.6 times in the case of sample F2 and F3.
2. NH_4 indicator presents exceeds as it follows:
   - of 1.94 times in the case of sample F1;

- of 1.22 times in the case of sample F2;
- of 4.12 times in the case of sample F3.

3. Cu indicator presents exceeds of 1.3 times in the case of sample F2.
4. Pb indicator presents exceeds as it follows:
   - of 1.98 times in the case of sample F2;
   - of 3.65 times in the case of sample F3;

CONCLUSIONS

Underground sample water analyze reveals next:

- the activity nature justifies the growth of organic substances content;
- repeatedly losses of tanken products can be the cause of easy grown content of lead;
- phreatic dynamic as well as the fact that the phreatic canvas is being found at low depth, determines mobilization of metal cations, favorizing their ascent in the superior layers and the growth of their concentration in underground water and soil (Domuța, 2000);
- a possible natural fund of the area, richer in copper;
- the higher presence of copper in a large variety of products that become waste;

In conclusion we remarke the fact that the landfill area represents a potential source of polution for soil and subsoil and through this the quality of underground water.

To identify the optimal possibilities of valorification of the dump field we recomand:

- quantity apreciation of rainfall level and obtained data corelation with the quality parameter evolution of water (Vicaş et. al., 2010);

- seasonal monitoring, at thaw and in maximum rainy periods, of underground water quality (Mănescu, 1994);

- using alocated funds by the Consiliul Judetean Bihor through POS Mediu by closing and following after-closing of the deposit;

- ecological reconstruction of the site;
- optimal alternatives indentification of field valorification.

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