

## STUDY ON THE INFLUENCE ON WATER QUALITY DUE TO THE OPERATING LANDFILL TARGU JIU

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**Abstract:** New setting up technologies for landfill, leachate collection requirements and procedures for its treatment lead to a reduced environmental impact. Proper sealing works associated with those one of leachate collection and gas from deposit lead to influences with reduced environmental impact in general.

**Keywords:** landfill, leachate, permeate, reverse osmosis, sealing, drainage.

### 1. INTRODUCTION

The study was conducted since putting the landfill into operation, March 2009 respectively until present.

The location of the organic household waste landfill Targu Jiu is located on "Calului" Hill, at about 7 km from Targu Jiu.

Choosing the location of the organic landfill for waste Targu Jiu was done taking into account the following elements:

- Large area of the site - 37.9 ha;
- High storage capacity (1,925,310 m<sup>3</sup>) and a long duration of exploitation of about 40 years;
- The presence of a natural clay layer with a thickness of more than 60m is an ecological barrier of protection for groundwater in the area. The drillings performed in this area have identified groundwater at depths exceeding 140 m.
- The nearest watercourse, River "Iaz" is located at a distance of about 500 m from the landfill's site.
- Predominant wind direction from inhabited area to the landfill.
- The natural, by the presence on three sides of the forest, offers the possibility of a natural plant barrier.
- Possible connection to utilities (drinking water, electricity) from existing networks in the area.

### 2. EXECUTED WORKS

#### 2.1 Works of embankment were:

- Excavating soil layer.
  - Modeling the deposit base for ensuring the functioning of leachate collection and disposal
  - Compaction of the landfill's base in order to install geosynthetic materials
- Resulted earth after digging was used to build perimeter dikes.

Perimeter dikes are embankments of earth, with heights of  $h = 2\text{m}$ ,  $m_{\text{ext}} = 1:2$   $m_{\text{int}} = 1:3$ . Estimated

length of the dikes is 1.011 km, of which for section 1 – 370 m.

Subdivision dikes are made of shale clay from the site. The dike has an average height of 2m, with an outer slope with a gradient of 1: 2 and the inner slope with a gradient of 1: 3.

Its length is 344m.

Rainwater which drains from the northern outer slope of first compartment was collected directly in Cn1 and rainwater on the eastern outer slope in the rainfall channel from the road.

Landfill's perimeter is surrounded with metal fence with a height of 2,00 m to prevent the exit of light waste from the landfill and damage adjacent land.

#### 2.2. Sealing system

- GM - geomembrane from HDPE with  $t = 2$  mm
- GT - geotextile with  $m = 1\ 200$  g / m<sup>2</sup>, respectively UV resistant geotextile on slope
- drainage layer of gravel sort 16/32 mm, thickness 50 cm;
- GT - layers separator geotextile with  $m = 200$  g / m<sup>2</sup> on landfill's basis, over drainage layer
- Leachate drainage system - consisting of absorbent drains covered with a drainage layer of river washed gravel, non-chalk, sort 16/32 mm, thick of 0.50 m above the upper generatrix and between drains.

### 3. COLLECTION SYSTEMS AND WASTEWATER TREATMENT

#### Leachate drainage

Leachate from the landfill surface is collected by an absorbent drainage system (HDPE Nd 250 mm with slots) and collector (Nd 250 mm HDPE) and gravity discharged into leachate drainage basin with a volume of 850 m<sup>3</sup>. Leachate collected into the reservoir is pumped to the modular treatment plant that operates on the principle of reverse osmosis.

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Permeate produced after treatment of leachate is passed through a sample permeate premise with a capacity of 4 m<sup>3</sup> and reaches further the basin for rainwater. From here the water is discharged into the railway station rainfall and further into the Iaz River

#### Domestic sewerage

Domestic wastewater from all toilets reaches mini-treatment plants from where, after treatment, is discharged into the channel Cn1. Channel Cn1 discharges further in the channel from the railway and after into the River Iaz.

The amount of domestic wastewater is:

$Q_{\text{wasted day max}} = 3.08 \text{ m}^3 / \text{day}$

#### Wastewater collected from the wheel washing basin

It is discharged into the channel Cn1, after passing previously through a decanter and fat separator. The amount of water used for washing the garbage trucks' wheels is maximum 1m<sup>3</sup>/day.

#### Rainwater collection system

Rainwater is the main cause for the production of leachate in a landfill. A proper management of rainwater reduces the cost of treating the leachate in a landfill, reducing pollution risks by avoiding contact with waste.

Waters from the outer slopes of the perimeter dike are collected as follows:

- Rainwater on the western perimeter dike is collected by a guard channel with a length of 150 m, with discharge Cn1.

- Rainwater from the northern outer slopes of the perimeter dike is collected directly by the channel Cn1;

- Rainwater on the eastern slope of the perimeter dike is collected by the trench on the road.

Rainwater from the basin water is discharged in the rainfall channel from the railway station.

- Water from the old clay mining's slopes is collected by Cn1 channel and overflowed into the existing header at east of the existing site to be discharged into the River Iaz.

#### Leachate treatment plant.

Is a modular wastewater treatment plant, which operates on the principle of reverse osmosis, with a system of filters and membranes having a maximum working pressure of 60 bars, and capacity of 90 cubic meters per day. The amount of leachate produced on average is 0.37 l / day / sq. Purification on the principle of reverse osmosis removes suspended matter, ammonia nitrogen, reduces heavy metals and dissolved materials.

After treatment, permeate is discharged into a sample premise for permeate with a capacity of 4 cubic meters, further being discharged into the basin for rainwater. After that, the water from rainwater basin will be discharged into existing channel and further into the River Iaz. Before treatment, leachate undergoes a process of pH lowering with sulfuric acid, and before disposal the pH is adjusted to normal values using caustic soda (NaOH)

The entire purification process is automated, adjusting the parameters being controlled through a computer. The station automatically measures and adjusts the

pH, conductivity and temperature, according to these parameters being performed a purification process that leads to bordering into legal limits of permeate at the moment of exhausting into natural receptors.

#### Leachate collection basin

Collected leachate through the drainage system from the premises is gravity discharged inside the pumping premises, and pumped into the leachate basin. This one is a reinforced concrete basin, geomembrane sealed, with a useful volume of 850 cm. Basin's dimensions are: 22.6 x12, 6x4, 50 m. Leachate basin is covered with galvanized corrugated roofing sheet mounted on a metal farm. From the basin, the leachate is pumped into the purification plant in order to be treated, with a pumping station equipped with 1+1 pumps for wastewater, with the following characteristics:

- $Q = 0.05 \text{ l} / \text{s}$

- $H = 15 \text{ m}$

Sewage treatment station - is bio – mechanical type Bio-Cleaner BC8 which achieves the purge of the household wastewater from toilets of administrative headquarters, scale cabin (mini-station of treatment MSE1), toilets and showers from the dressing room (mini-station for treatment MSE2).

Those treatment plants are automated, with a capacity of 1.2 cubic meters per day each, and for loading in CBO5 of 480 g / day. Purified water satisfies the conditions of NTPA 001/2005, being discharged into Cn1 channel.

## **4. STORM WATER FLOW**

Rainwater is managed as follows:

- Water from the dike's outer perimeter slopes are collected as follows:

- Rainwater on the western perimeter dike is collected by a guard channel with the length of 150 m, with discharge in Cn1.

- Rainwater from the northern outer slopes of the perimeter dike is collected directly by the channel Cn1;

- Rainwater on the eastern slope of the perimeter dike is collected by the trench road

- Access roads have rainwater trenches that discharge either in Cn1 or in basin for rainwater.

From the rainwater basin water overflows into the channel from railway station.

Rainwater from the concrete platform and buildings' roof (locker room, hall equipment) is collected by a boxed channel with cracker data, with a length of 120m, which discharges into the channel from the road which edges the basin for rainwater.

- Water from the slopes of the old clay mining is collected by channels Cn1 and Cn2, discharged further into the existing collector situated at east of the site, in the point on the railway bridge, which overflows in the River Iaz.

## **5. OBSERVATION DRILLINGS**

For the execution of geotechnical and hydrogeological study were performed 7 hydrogeological drillings, 3 of which have been equipped in order to accomplish the function of monitoring drillings for the quality of the infiltrated

water up to this level. They were situated in this way to be achieved a situation on water infiltration's characteristics upstream, downstream and sidelong of the landfill. Two of the drillings have the depth of 20 m and the third one of 30 m. Should be noted that till 30 m depth were not met gravel layers with quartered ground water, only shale and clay dust. In the area of separation between the clay layer, in time there are accumulated small amounts of water transferred by the clay layer. Its quality will be monitored in the operational phase of the landfill and after closure. Hydrogeological

drillings performed at field study phase were equipped for monitoring.

### 6. RESEARCH RESULTS

For groundwater were not performed measurements because of the lack of water in observation drillings.

Measurements taken in April (04), May (05) 2010 on general discharge effluent after treating leachate in the treatment plant and also analysis carried out on natural receptor, River Iaz, upstream and downstream from the discharge point. Measurements on natural receptor are presented in the Fig.1

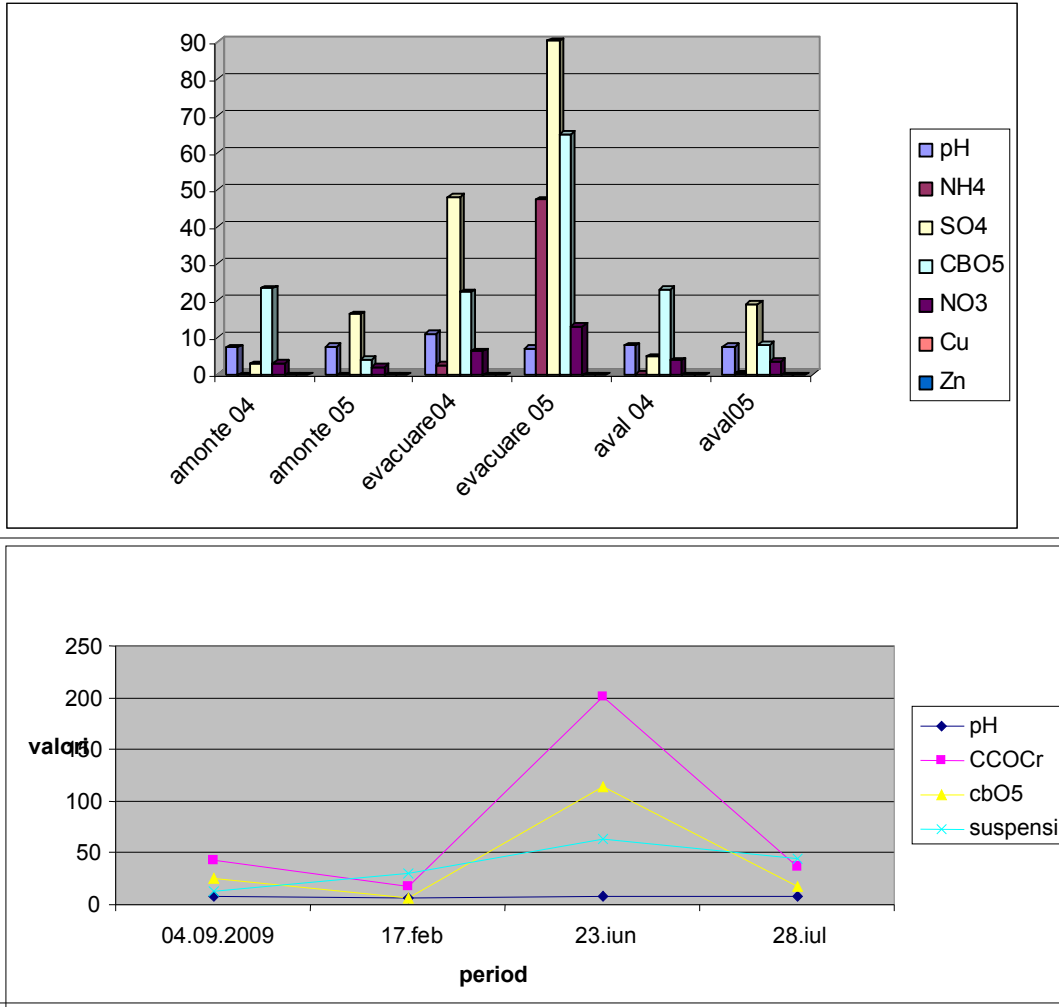


Fig.1 Measurements on general discharge effluent

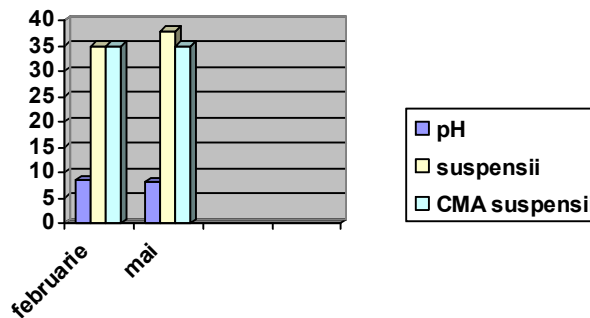
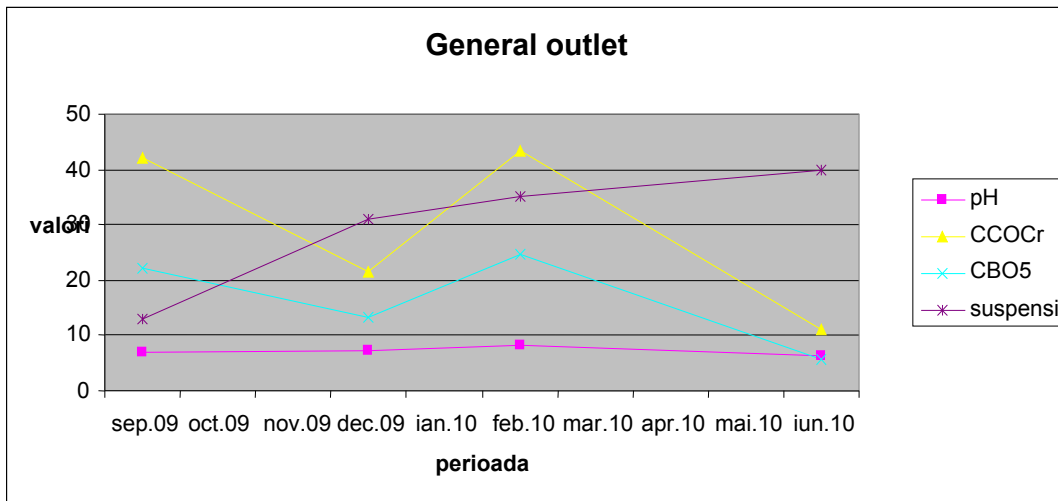


Fig.2 . Measurements taken on the CN 1



**Fig.3. Measurements on general discharge effluent**

Measurements taken on the general evacuation of the permeate from treatment plant before being discharged into the natural emissary are presented in the Fig.3:

### 7. CONCLUSIONS

- a) Storage cabinet was arranged so as to protect soil and groundwater by sealing the base and slope of the landfill.
- b) Leachate collection and evacuation from landfill's inside is achieved through absorbing drains.
- c) The resulted concentrate following leachate treatment is collected in a basin for concentrate, with a volume of 8 cm.
- d) Permeate is released in a sample premise for permeate with a volume of 4 cm.
- e) The rainwater is collected through a system of drains and guard channels, their leading being made towards rainwater tank and subsequently into emissary.
- f) Natural receptor-stream Iaz – during the studied period did not hange with regard to parameters rebuired by NTPA001/2005

g) Equipping modular wastewater treatment plant with the possibility of extending, depending on growth of the landfill capacity and of the needful leachate volume.

h) An influence of rainfall on waste disposal area about permeate quality must be taken into account.

i) The effluent quality upstream water discharge in surface water is influenced by rain of water collected from waste disposal area.

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