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ALTERNATIVE SOLUTIONS FOR ACCOMPLISHING WASTE STORAGE FACILITIES

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ABSTRACT. Waste depositing is defined by several researchers as their “return” to the natural environment and this is accomplished in the best conditions and it is constituted in a filiation of treating waste.
The field for waste depositing should be established in agreement with the local sanitary authorities and the environment protecting one, having hydrologic, topographic, studies that could allow the establishment of the measures in order to avoid the risks to pollute the environment.
The emplacement of the controlled depositing fields should consider the distance to the urban or rural agglomerations, the direction of the dominant winds, the position to the water sources and to other objectives for which we should keep a sanitary protection area.
This work presents the importance of the waste controlled storage in Romania.

АЛТЕРНАТИВНИ РЕШЕНИЯ ЗА СКЛАДИРАНЕ НА ОТПАДЪЦИ

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РЕЗЮМЕ. Складирането на отпадъци се определя от някои изследователи като „завещание” към естествената природа, извършвано при най-добри условия и специално третиране на тези отпадъци. Мястото за складирането им се определя от местните санитарни власти, съобразено с екологичните, хидроложките и топографските специфики на района.
Разположението на тези контролирани депа трябва да се съобрази с отстоянието им от градски или земеделски земи, преобладаващата посока на вятъра, местоположението на водоизточниците и други цели с осигурен санитарен контрол.
Докладът представя важното значение на екологичното складиране на отпадъци в Румъния.

Introduction

Waste pollute the water, the air, the soil, the landscapes on big surfaces and they require high costs for their depositing.

Even if post-depositing incineration constitutes a much more beneficial solution for the environment, due to the big costs implemented on its national scale, the storage will mainly remain the option to remove the wastes in Romania, as in other European countries.

In the worldwide practice, as in our country, the predominant one is still the waste discharge in the so-called “cesspits” that are actually some holes come either from natural geographic hollows, or they result from certain field stripping or building quarries (for sand and bricks) [1-4, 6-8].

Lately, these holes around the localities are less and less, making room for the new ecologic storages or to the new waste administration systems, and the distance to the ones left or to the building ones is bigger and bigger, so the transport costs of the collected waste are increasing. This is why we also use other fields that are not totally holes, but fields that are less fertile for the agriculture, a part of them being arranged so that the waste storage could be vertical, in depth and height – reported to the level of the respective field surface. In Romania, most of the storage facilities date since the ‘80s and they are overcharged.

For the old storage facilities, there are no projects and measures to solve the pollution. Beside the residual, street and commercial wastes, the industrial or dangerous waste are also introduced in the waste storage facilities. As a member of the European Union, Romania should adopt civilized methods to collect, deposit and remove the wastes. This is why Romania should have ecological waste storages, according to the European norms. Romania promised to build new ecological waste storage facilities and to close all the cesspits.

So, in conclusion, a waste storage facility is achieved depending on the emplacement, the waste quantity and the nature of the ones to be deposited and it should protect the population and the environment.

Waste quantities

Table 1 presents the evolution of the deposited waste quantity

Table 1
Evolution of the deposited waste quantity

Name of the storage	*Deposited waste quantity*					
Muni-cipal storage	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
	5,562	*5,987*	*6,157*	*4,300*	*3,782*	*3,268*

The average composition of the residual waste collected from the population is given in table 2.

Table 2
Average composition of the wastes

Waste composition	*Waste quantities (tone/year)*	*Percentage (%)*
Paper and carton packaging	*587*	*5*
Glass	*632*	*6*
Plastic packaging	*3372*	*33*
Wood	*220*	*2*
Biodegradable	*3457*	*34*
Metal	*941*	*9*
Wastes from gardens and parks	*156*	*1*
Others	*1000*	*10*

The practical accomplishment of the waste storage facilities

The basic criteria required to the emplacement of any waste storage facility [5].

1) Allowing the depositing servicing of several localities in the neighbourhood;
2) Presenting stability referring to the environmental conditions;
3) Being near a versant that should not bring the danger of landfall, the presence of some springs or near an emissary (a river or a drying out channel);
4) The geological structure with a healthy soil structure, with no crevices or karst formations under the emplacement, earthen, and the level of the underground waters to the foundation rate should be at a 5 meters depth;
5) The geo-technical features should allow an efficient economic gauge
(the height of the storage body should be smaller than 40 meters), with execution possibilities of 50 % in cut and 50 % in backfill;
6) Excluding the risk of the flood danger or of the washing by the flood waters;
7) Being at bigger distances than the ones minimum admitted by norms and standards to the human settlements, communication ways, water alimentations, protected areas;
8) Avoiding the areas of underground cables (electricity, telephone) or other networks of underground uses (supplying conducts / drainage);
9) Not presenting the risk of the possible breaks of the deposit to the human settlements or to the lakes;
10) Presenting stability to the seismic phenomena.

As the emplacements corresponding to the waste storage facilities, we recommend the borrowed holes, the natural hollows, the bogs, totally damaged or intensely polluted fields etc.

Figure 1 presents the composition scheme of a waste storage facility.

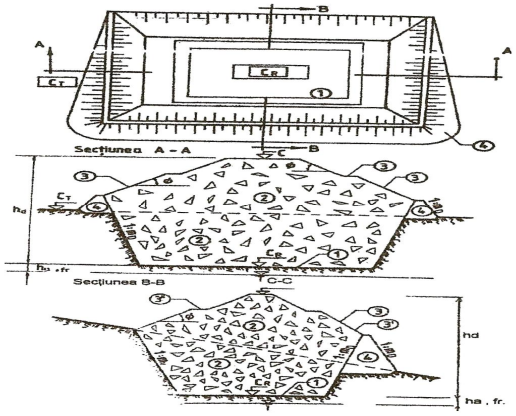

Fig.1. General composition of a waste storage facility

For a controlled waste storage facility to provide a complete technological flow (pre-sorting, recycling, energetic capitalization, collection, transport, purge and leachate evacuation, civilized environmental framing, quantitative and qualitative evacuations of the wastes), it should contain, beside the proper constructions:
-A network of access and manipulating ways, a control-input-register point;
-A technological platform and a motor washing ramp;
-A body of administrating and social buildings;
-A sorting station, deposits for the materials of selective collection;
-Its own group and network of water supply and drainage, in connection to the purge station with composting platform;
-Electric energy supply, respectively the afferent electric networks post Trafo;
-A monitoring system afferent to the quality protection of the environmental factors and to the activities;
-A borrowed territory (area) quarry for the covering layers and the embankment works;
-A protecting and isolating plantation (ecological masking) and an alignment of the surrounding construction.
Figure 2 presents the general scheme of arranging a waste storage facility.

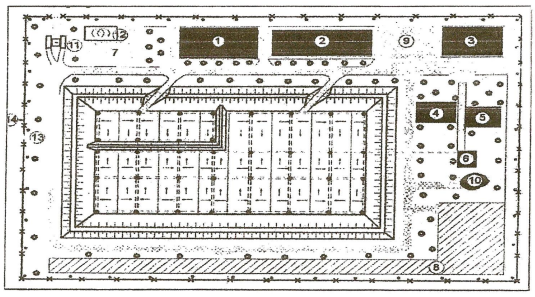

Fig. 2. The general scheme of arranging a waste storage facility
1 – administrative building; 2 - locker; 3 – sorting station; 4 – biogas station; 5 – purge station; 6 – collecting basin for leachate; 7 – parking; 8 – borrowed area for the covering layers; 9 – technological platform; 10 – decanters for leachate thickening; 11 – platforms for weight; 12 – post Trafo; 13 – protecting plantation; 14 – enclosure

The geometry of the waste storages (the form and the sizes in the horizontal and vertical plans) often follows the orography of the emplacement field, but it is influenced by:

- hydro-geology of the profile under the territory (the level of the underground waters, non-corresponding or rocky lands, having excavation difficulties);
- The embankment stability for cut and embankment;
- The maximum possible gauge (related to the settlement/stability angle of the wastes);
- Providing the stability of the consolidation/separation stability or of the drainage and the financial possibilities.

It is important to emphasize the fact that, when the storage services great urban areas (big volumes), the possible gauge that is to be accomplished in the vertical plan influences the necessary surface of the storage. Depending on all of these, the general constructive solutions may be according to each other, or mixed between the solutions presented in figure 3. – a, b, c, d.

The option for the constructive scheme in figure 3.3. depends on the resistance of the natural layer of non-contractile and hardly permeable argyle.

But there are also other ways to arrange certain waste storages, one of them being presented in figure 4.

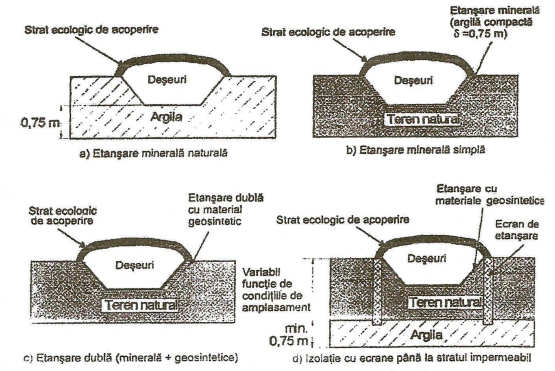

Fig.3. The constructive solutions of the waste storage facility:

a) natural mineral consolidation; b) simple mineral consolidation; c) double consolidation (mineral + geo-synthetic); d) display isolation to the impermeable layer.

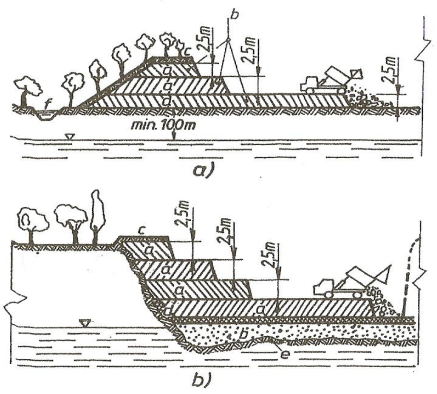

Fig.4. Ways of arranging some waste storage facilities a); b)

Another viewpoint afferent to the constructive solutions of the waste storage refers to the accomplishing way by means of the emplacement orography and of the embankments needed by the execution. A storage can be accomplished in the following types of constructive schemes (figure 5):

a) Storage in backfill;
b) Storage in cut;
c) Storage in semi-backfill;
d) Storage in semi-backfill.

The optimal solution, from the embankment viewpoint, is the one considering the rate of the phreatic waters and of the soil texture under the field line.

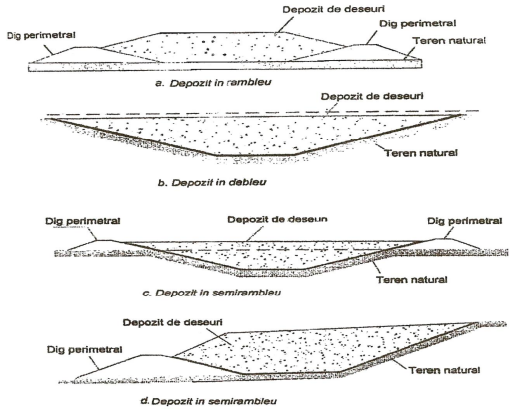

Fig. 5. Constructive solution from the viewpoint of the emplacement orography

The essential functional roles of the two basic components of the storage facilities, of the roof and of the field (figure 6.) are:

1) the ones of the roof:

- Collecting and evacuating the pluviometric leakages outside the perimeter;
- Draining and evacuating the meteoric waters infiltrated through the superficial vegetal layer;
- Consolidating and isolating the storage body;
- Collecting, stocking or burning the fermentation gas;
- The ecological framing in the area environment.

2) of the field:

- filtrating the leachate resulted from the waste proper humidity;
- draining, transporting and evacuating towards the purge station of the leachate;
- consolidating its perimeter for stopping the possible leachate infiltrations towards the subsoil;
- establishing/ reinforcing the field perimeter and its embankments.

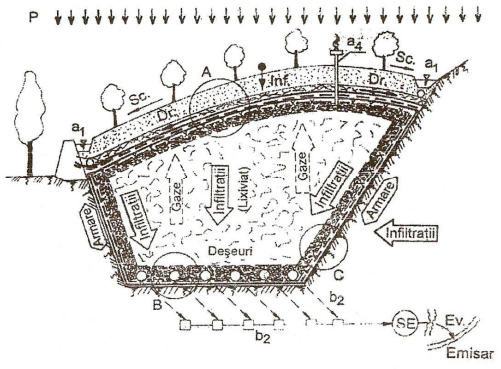

Fig. 6. The functional roles of the roof and field of a storage facility

For sizing the controlled depositing ramps of the residual ramp wastes, we start from accomplishing the topographic plan of the field, after it was chosen based on the geo-technical and hydro-geological study approved by the local sanitary and agricultural organs.

The ramp surface and volume should have a depositing capacity of the residual waste in the locality for which the ramp is build, during several years, and its first calculation element is the average quantity of yearly wastes.

Closing the non-ecological waste storage facilities

Due to several factors, such as the operating conditions, the insufficient depositing capacity, the incompliance with the environment protecting standards, the current waste storage facilities should be closed and monitored on a certain lapse of time.

A storage or a section of the storage is closed in the following situations, according to the valid legislation:

- When we accomplish the conditions contained in the authorization/environmental integrated authorization referring to the operation lapse of time;
- At the demand of the deposit operator and after being analysed and approved by the competent authority for the environmental protection;
- Through a motivated decision of the relevant authority for the environmental protection

The closing system of the storage facility should provide:

- The isolation of the deposited wastes
- The administration of the fermentation gas;
- The administration of the produced leachate;
- The administration of the precipitation waters
- The return of the field into the landscape.

The covering system of the storage facility

The technical solution of closing the storage facility supposes the instalment of a closing system consisting of:

- A layer thick of 0.50 m, consisting of sand or other inert materials (construction wastes, demolitions etc.), with the maximum particle size of 0.10 m that should provide the necessary flatness and carrying capacity;
- A filtrating layer for 0,30 m thick gas, composed of gravel of 8/32 mm;
- An impermeable layer of compacted argyle, thick of 0.50;
- A draining layer for the precipitation waters, thick of 0.30 m, composed of gravel 4/32 mm;
- Separating geo-textile for avoiding the clogging of the draining layer;
- Covering with soil, thick of 1.0 m, among which 0.20 m vegetal soil where vegetation will be planted.

The closing system will be installed after the accomplishment of a waste evenness and systematization.

For evacuating the precipitation waters, we will stipulate perimeter gutters, in order to discharge the meteoric waters. Figure 7 presents a closing system of a storage facility.

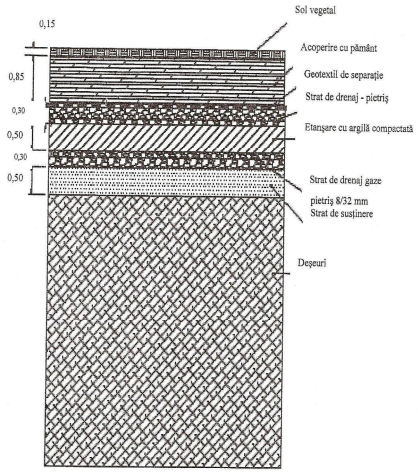

Fig. 7. The scheme of a closing system of a storage facility

Conclusions

For keeping the relatively small costs and for creating better observation possibilities on the environmental pollution, we find the tendency to accomplish certain controlled depositing ramps as big as possible, in detriment of some economical necessities of having several ramps of smaller capacities, at optimal transport distances.

It is recommendable for the localities of more than 300.000 inhabitants to have two ramps of controlled depositing.

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