

Sowed biodegradable geotextile for fixing the ash dump of coal and preventing pollution

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ABSTRACT: In Romania, coal thermoelectric power station is producing over 27 million tones of coal ash by year. The coal ashes accumulations existing now on approximately 1830 hectares, are leading to the elimination of large areas from the agricultural circuit and are contributing to landscape degradation. Moreover the dump heap are easily spreader by the wind leading this way to atmosphere pollution by large quantities of dusts, plant and soil pollution near the dump heaps. The collaborative researches by Research Textiles Institute of Bucharest and researches from the University of Agricultural, Faculty of Land Reclamation and Environmental Engineering have been produced a geotextile biodegradable. As a result of researches concerning the use of this product, it was proved that it could be used with good results in environmental arrangements especially for ash dump heaps covering for preventing environmental pollution.

1 INTRODUCTION

The large quantity of coal ash is largely exceeding the possibilities for the cement industry, materials of buildings.

The modalities for tilling the dump heaps can be relayed as following (Blaga, Gh.. et al, 1985 and Nasta, St. et al., 1992):

- covering with a 10-15 cm thickness vegetable soil layers and tilling with field plants;
- doing a soil-ash mixture on the surface, having 10 cm thickness and tilling it with plants;
- moisten the dump heaps surface for preventing ashes spreading especially while the plants are young;
- chemical stabilization by using substances that are reacting with the chemical components of the ashes and are forming a crust at the surface of the dump heaps.

2 BIODEGRADABLE GEOTEXTILE CHARACTERIZATION

The collaborative researches from the Research Textiles Institute and researches from the University of Agricultural Sciences and Veterinary Medicine, Faculty of Land Reclamation and Environmental Engineering, a geotextile named BIOIUTA have been produced. The BIOIUTA physico-mechanical characteristics are shown in the table 1.

As a result of the researches concerning the use of this product, it was proved that it can be used with good results in environmental arrangements especially for ash dump heaps covering for preventing environmental pollution (Siminea I. , 1996).

The geotextile have been produced from flaxen and humped offals, organically materials, that are decaying in time. The product is included in non-woven geotextiles and have been produced in two alternatives:

- with incorporated seeds, during the producing process;
- geotextile without seeds, the sowing having been made after the laying of the geotextile on the ash surface.

For sowing have been used graminaceae and vegetable seeds.

The plants have been tilled in single and mixed crop growing.

The researches have been conducted in laboratory (Vegetation House) and on the field (the dump from Thermoelectric Power Station – TPS).

Table 1 Physic-mechanical characteristic of biodegradable geotextile

Characteristics	U.M.	Value	Romanian standard
Total weight	g/m	800±80	STAS 124/73
Wet weight	g/m	7000±700	
Initial thickness	mm	7.5±1	STAS 139/86
Wet thickness	mm	8±1	
Initial porosity	%	93±5	
Water saturation capacity	%	40±5	STAS 12150/89
Saturation capacity	%	700±100	STAS 6143/85
Draining strength initial			
L min	kgf	1.3	
T min.	kgf	2	
Breaking elongation			
L	%	20±0.5	
T	%	15±0.5	
Air permeability	l/m x sec	800±0.5	STAS 6902/70
Absorption capacity			
24 hours	%	750±50	
48 hours	%	1200±100	
Resistance to micro-organisms action		medium behaviour	STAS NFx 41- 601/71

3 STAGES OF THE RESEARCH AND RESULT OBTAINED

3.1 *In the Vegetation House*

In the first stage the researches have been conducted in laboratory condition for establishing the plant species that are developing on the ash dump. The ash dump from TPS Isalnita and TPS Mintia have been studied as support layer for sowed geotextile.

The ash dump from TPS Isalnita is from basin coal bearing of Motru and it is representative for the lignite ash dump of our country, in the coal thermoelectric power station Mintia (TPS Mintia) are burned brown coal and pitcoal.

Even the ash dump are not a recommended medium for the plant growing and developing by using geotextiles and other improving chemical and biological techniques it can be created an improved area for plant cultivation.

From the results obtained in the Vegetation House in two years period, a non homogenous developing of plants have been noticed influenced by several factors:

- the material as a support on which the geotextile have been laid;
- the type of the geotextile – sowed or nonsowed;
- if fertilisers have been sprayed or not;
- plant species that have been cultivated.

As a result of issues obtained from the laboratory the experiment have been extended in the field. The ash dump from TPS Isalnita have been selected because on the ash dump of Mintia the plants developed poorly and started to turn yellow.

3.2 *In the field from the Thermoelectric Power Station Isalnita (TPS Isalnita)*

The geotextile have been laid directly on the ash, perennial plants have been tilled

The experiment have been followed in the field during three years (Siminea I., 1996). From the observation made in the field have resulted:

In the first year, the plants raised and developed but their density was not homogenous. In the gaps between the plants, the geotextile represents a protection against the ash spreading.

By periodical haymaking, the plants blossomed and a vegetal cover have been created forming a protection against ash spreading.

In the second year of vegetation the plants haven't been hayed to follow the selfsowing process.

In this year vegetal cover was rich and complete. The nature plants richer 1-1.5 m high. It was no haymaking.

In the third year the surface have been cleaned of dead plants resulted from autumn. In this year the vegetable cover was rich with high blossomed plants. The selfsowing process was evident for alfalfa.

Following the geotextile behaviour during during years, in the first year a light decaying have been observed but in the second year when the vegetation was permanent (a certain humidity have been maintained), the geotextile decayed 80%.

Under the geotextile the humidity of the ash is important. This organic layer is maintaining a high humidity supporting a favourable microclimate for plant development. In the third year the geotextile totally decayed but the vegetable layer do not allowed any more the ash spreading.

4 CONCLUSIONS

For environmental protection, in the coal dump heap areas are recommended geotextiles using On the surface of the dump heap because it is an efficient way for fixing the ash and improving the landscape.

The geotextile is replacing the soil layer supposing to be layer on the surface of the dump heap if used biological fixing methods.

The geotextile is maintaining the necessary humidity for plant root development. The ash dump is a high permeability material. By decaying the geotextile is increasing the biological, chemical and physical qualities of the superior layers of the dump heap ash. The surface protected by the geotextile is not under direct solar radiation resulting a real protection against severe evaporation. In the first period for plant vegetation the geotextile is supporting the plant root development of all kind of plants tilled or spontaneous growned.

REFERENCES

- Blaga,Gh., Miclăuș, V., Dumitru ,M.,Nastea,Șt. Bunescu, V.,1985. The installation of natural vegetation on waste dumps of Căpuș Mining Enterprise –country of Cluj-.In Proceeding National Conference of Soils Science, Timișoara;
- Nasta, St., Dumitru, M., Răuță, C., 1992. Reasrch for agricultural utillization of the ash dump of coal. The Annals of ICPA , tome LI, page 223-236, Bucharest.
- Siminea, I., 1996, Reducing environmental pollution by sowed biodegradable geotextil utilization. In magazin The Environment, Bucharest.