AMBASSADORS OF THE ENVIRONMENT BIO MECHANICAL TREATMENT OF SOLID COMMUNAL WASTE – "THE GIFT THAT LASTS FOREVER" (ECONOMY-ECOLOGY-ENERGY)

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Abstract: Instead of our conclusion on bio-mechanical treatment (BMT) we will cite the opinion from 30. October 2009. of the National Ministry for Environment and Spacial Planning : " We consider this treatment, according to the current regulations and current global experiences, a good way to treat current and future solid communal waste".
Explanation: " From the received documentation, attest and references it was concluded:

Biological remedy of polluted environment is the most effective and successful procedures, that is largely implemented all over the World, and that uses microorganisms as agents in the chemical processing. The main advantage compared to other remediation processes is that through the waste is decomposed through the metabolism of the microorganisms and this procedure or its products are not hazards to the environment or to humans.
After the Bio-remedy process the contaminated material (communal waste, land, water), does not represent waste any longer and has its environmental and economic value. The material can be used as an remedy for devastated land, it can be returned from where it originated before it was treated and it decontaminates the space (these are mostly waste lands, landfills, anti-erosive work spaces, etc.)
One of the oldest, most effective, and useful ways of recycling is precisely Bio-mechanical treatment of organic waste, which is the number one components of solid communal waste in Serbia. It is based on a natural process, which is important, because it is good to give back to nature at least a part of what was taken.
Key words: bio mechanical treatmant, communal waste

Rezime: Umesto naseg zakljucka u vezi mehanickog bioloskog tretmana (MBT) citiracemo misljenje od 30 oktobra 2009 godine koje je tu metodu dostavilo Ministarstvo zivotnesredine i prostornog planiranja Republike Srbije :
Misljenje : " Smatra se da ovaj postupak , prema postojecim iskustvima u svetu i posrojecom zakonskom regulativom , moze primeniti pri preradi postojeceg i buduceg cvrstog komunalnog otpada ".
Obrazlozenja : " Na osnovu dostacljene dokumentacije , atesta ,i referenci konsrtatovano je:
Bioremedijacija je jedan naj perspektivniji postupak u zastiti i revitalizaciji zagadjene zivotne sredine , koji se u svetu masovno primenjuje u kojem se u uzem smislu kao ' agensi " procesori primenjuju mikroorganizmi . Osnovna vrednost sa ostalim postupcima remedijacije je u tome sto se , zahvaljujuci metabolickim sposobnostima mikroorganizama , kontaminat na komponente koje nisu stetne po coveka i zivotnu sredinu.
- Nakon bioremediocionog postupka kontaminirani materijal (komunalni otpad , zemljiste ili voda) ne predstavljaopasan otpad vec materijal koji imasvoju upotrebu pa i ekonomsku vrednost i moze se ponovo upotrebiti npr. vracanjem na mesto odakle je uzet (iskopan) pre primene remedicajnog postupka ili kao biooaktivan materijal u postupku rekultivacije degradiranog zemljista (komunalne deponije , povrsinski kopovi , antierozioni radovi i sl.) "
Jedan od naj starijih , naj efikasnijih i naj korisnijih vidova i nacina reciklaze je bio - mehanicki tretman organskog , otpada , pretezne komponente u komunalnom otpadu u Srbiji , jer se zasniva na prirodnom procesu - vratiti bar deo prirodi ono sto je od nje uzeto.
Ključne reči: bio mehanički tretman, komunalni otpad

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1 TECHNICAL DETAILS OF THE HELSASORB-Eco System

Helsasorb – eco system is a bio-mechanical treatment of solid communal waste. It was developed by "Helsa", a German company, and it has been successfully implemented in many EU countries. Bio-mechanical processing of solid communal waste, where active coal is the main component and its use and extraction is patented, represents from a technical, economical and environmental standpoint one of the newest and most innovative ways of processing waste. At the same time this is one of the simplest and safest ways to treat waste. Through this process the following affects are made[1]:

- Decomposition and stabilization of the organic parte of the waste
- Hygiene regulation of the waste
- Reduction of unsanitary smells to a zero.
- Reduction of the waste mass on dump sites (up to 40%)
- Little investment
- Excellent aspect between the money put in and the results gained
- Short period of waste treatment
- Creating the conditions of waste selection after treatment

In this presentation the entire process of solid public waste treatment with the 'Helsasorb-Eco' system is described.

In the preparation period for the treatment it is vital to involve the client (public communal company) with the existing mechanisms and workers who are being trained to work on the treatment as well.

If the selection of the waste is not done before the treatment, which is very common on Serbian dump sites, the selection must be done after, and there is significant quantity of secondary raw materials (plastic, metal, glass etc.) being put a side. For this procedure there is special mechanization and equipment. With further treatment of biodegradable waste quality compost can be produced and then placed on the market[8].

We would particularly emphasize the following [3]:

1. The preparation for the treatment is three to five days (3-5)
2. The treatment is four to six (4-6) days long depending on the conditions (temperature, humidity etc.)
3. All invested materials (except foil and bio substrates) are a one time investment,
4. The foil(unless it is physically damaged) can be used up to five or six times (5-6)
5. The shredder for the preparation (grinding) of waste for the treatment and the drum for separation (after the treatment) can be used on more then one dump site, since they are mobile machinery.

Here it should be specified that in the lack of funding for the mechanical treatment of solid public waste, the use of the shredder and drum is not necessary. In that case it is curtail to select the waste before the treatment and separate the secondary material (plastic, metal, glass, larger waste like accumulators, tires, animal waste etc.). For this from seven to ten (7-10) workers are needed. I n Serbia the unemployment rates are big so this is no problem, on the contrary it is an opportunity for workers. The method of public groups working for the goal of solving dump site problems is a chance for Serbia to make an important step in preserving the environment.

2 DESCRIPTION OF THE SYSTEM AND SPECIFICATION OF THE NECESSARY EQUIPMENT AND MATERIALS

The system has the following components[2]:

- Grinding machine (Shredder) for the preparation of the waste for treatment.

- not necessary, but preferable, it can be shared between more then one user.

- The Drum machine for separation(after the treatment) of biodegradable waste from other waste- namely secondary raw materials (without this machine, the selection of waste prior to the treatment is necessary)

- not necessary but preferable and can also be used for more then one user.

- Ventilator for compressed air, which can work on five (5) piles at once, the dimensions of the piles up to 12m x 30 m x 3.5 m.

- Main pipe Ø 200mm- about 35m long.
- Vent for the regulation of air flow- 8 pieces
- Thermometer- one for the whole system - Ø 200mm
- Anemometer- one for the whole system - Ø 200mm
- couplings and branches- 8 pieces DN 200/ DN 100
- Draining pipes Ø 100- 118m per pile
- Reservoir (tank) and sprinklers for the bio substrate solution- for this pilot project 30-50 thousand liters of water will be needed.
- Special foil
- Bio substrate (0,1 l/ton of garbage)
- The expense of beginners training depends on the time neede (560 € per day) [7]

The standard dimension for helasorb foil is 18m x 6m.

For one pile dimensions 12m x 30m x 3,5m it is required six (6) foils of standard dimensions, which in total is 648 m^2 per pile.

The overlap on standard dimension foils is 0,50m.

The foil can be used for 5-6 treatments.

3 THE WASTE TREATMENT PHASE

The complete treatment of public waste takes place in three phases:

1. **PHASE: Preparation of the waste and the space of the treatment**
2. **PHASE: Treatment of the waste**
3. **PHASE: Selection- the separation of waste**

The whole procedure takes place in continuity and the above listed phases overlap form the beginning. The preparation of the second pile takes place during the treatment of the first; the third phase commences after the treatment of the firtst pile, while the first and second treatment phases are already under way for the remaining piles.

Having in mind that public waste on our dump sites, for a long time, was deposited a while ago and that there was no selection process it is necessary to prepare it for treatment. The preparation's success is witnessed through the grinding of the waste, the better it grinds the more affective the treatment with the bio substrates will be. In this pilot project the plan is to do the selection prior to the treatment by hiring more workers, who will start by separating larger pieces non- organic trash.

The mass and volume relation is empirically determined, and the volume of one pile of circa 828 m^3 translates to circa 331 t.

During the setting of "piles" at the end of every work day it is necessary to liquor and cover the "pile".

The time to realize one treatment of one pile the size of circa 828m3 is six (6) weeks.

After the treatment of the first "pile" is done the preparation and placement of the second "pile" is done on the same place.

For one "pile" dimensions 12m x 30m x 3.5 m, the work space needed for the activities to be carried out appropriately, is approximately 646m^2.

For one "pile" there should be 648m2 of foil standard dimensions 18m x 6m, that is six (6) pieces.

If there is work being done on two "piles" there needs to be at least 1 300 m^2 of work space.

The Regulation of air flow depends directly on the temperature measurements inside the "pile". The air is regulated by vents. Specific instructions and manuals will be given on the spot and the workers that are continuing the process will be trained for the entire process. The regulation of the air flow on one "pile" is done according to the following recommended parameters[6]:

- Maximum air flow : 1.200m^3/h
- Optimal air flow: 0.5 m^3/h/t
- Optimal quantity of air on one "pile" 210m^3/h
- Optimal speed of air flow through the pipes: 2, 48 m/s

4 INVESTMENT PLAN

The price of expenses is conditioned directly by the quantity of available waste. The whole price can be divided into two items:

1. One time investment
2. Startup investment

One time investment means that the equipment is bought once and stays at the disposable in the County- the communal company for further treatments. One time investments are:

- Grinding machine (Shredder) for preparation (grinding) of the waste.
- The drum machine- for the separation (after the treatment) of biodegradable waste from other waste, secondary raw material.
- Compressed air Ventilator which can work on five (5) "piles" dimensions 12m x 30m x 3.5m at once.
- Main pipe Ø 200mm
- couplings and branches
- vent for regulation of air flow
- draining pipes Ø 100
- Thermometer
- Anemometer

Startup investment means the procurement of material for the complete treatment of waste in the first year of work, and after that the material needs to be renewed. Startup investments are[2]:

- Foil – for one year
- Bio substrate

5 SPECIFICATION OF EQUIPMENT, MAN POWER AND CONDITIONS THAT NEED TO BE PROVIDED BY THE MUNICIPALITY (PUBLIC UTILITY COMPANY) OR OTHER USER

Enough open space for the installations of the system.

Loader (or the equivalent, for the construction and maintenance of the piles).

Electricity for the ventilator, 240 V / 400 V, 50 Hz, CEE- plug in, 16 A.

Tank or supply of water with the right kind of pump, to supply 15l – 30l of water per 1 m3 of waste.

Man power:

- Leader of the project (if needed, because of the training, provide at least two people.)- They control and measure the temperature and follow all of the parameters in the process.
- Working power, seven to ten (7-10) workers to be engaged in the first 5-7 days of preparation of the piles and at the end of the cycle ofsieving and separation of the compost from non/organic material (only in case there is no grinder or drum). If there is a grinder and drum there should be only three to four (3-4) people working.
- There are three (3) more workers needed (in each shift one 3x8h) that take care of the ventilation system and that oversee the process, the supervisor of the shift (figure 1).

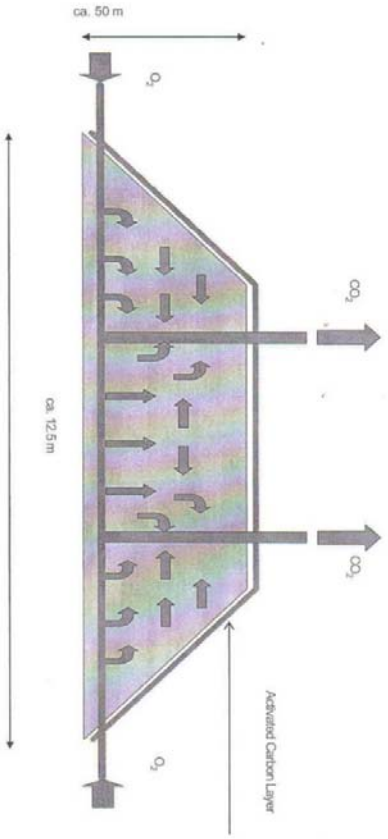

Figure 1 – Ventilation system

6 CONCLUSION

According to estimations and measurements that were conducted by the Faculty of Technical Sciences in Novi Sad, on the dump sites of solid public waste where non-selected waste is being deposited, the quantity of organic waste is more then 60%, and on the dump sites where there is partial selection (PET, tires, accumulators, metals) the percentage of organic waste is almost 80% of the entire waste. With bio mechanical treatment of this waste we would be gaining an extremely useful organic mater that has its economical affect as well. Beside it use for sanitizing devastated land (factories that manufacture dirt, bricks, cement etc.) is useful as a base for roads, fertilization of parks, forests, overlaying over

dangerous waste and so on. In this process we also gain organic waste that is suitable for the production of the so called "green energy" (electricity and heat energy).

It is evident that lately some Countries recognized the importance of bio mechanical waste treatment of solid public waste. Unfortunately Mayors and County officials use this "Europeanization" of their Counties and the resolution of waste issues (that are overflowing the population) only to market themselves and do not take real steps toward dealing with this issue.

The realization of this project, with the use of bio mechanical treatment of solid public waste and with giving a purpose to organic waste, in our humble opinion is only a matter of days before there is no dilemma if these projects will be realized, but weather how will their serious strategic implementation begin in the whole Republic of Serbia.

REFERENCES

[1] *Landfill Hattorf am Harz* (capacity 30.000 t/ann of solid communal waste– mechanical treatment),
[2] *Landfill Blankenhagen* (capacity 30.000 t/ann of solid communal waste– mechanical treatment),
[3] *Landfill Schoeneiche – demonstration plant* (capacity 500-1000 t/ann of soli dcommunal waste-mechanical-biological treatment),
[4] *Landfill Sansenhecken* (capacity 40.000 t/ann of solid communal waste– mechanical treatment),
[5] *Composting plant Gerolzhofen – demonstration plant* (capacity 1.000 t/ann)
[6] *Landfill Vranje (2006) – demonstration plant for atbilization of communal waste* (capacity ca. 300 t/ann),
[7] *Landfill La Spezia* (2001-2002) (capacity 20.000 t/ann of solid communal waste– mechanical treatment)
[8] *Municipality landfill Knic* (2009)