

WASTE TREATMENT IN MECHANICAL BIOLOGICAL TREATMENT (MBT) UNITS

TRATAREA DEȘEURILOR MUNICIPALE ÎN INSTALAȚII MECANO-BIOLOGICE (MTB)

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***Abstract.** The paper presents a study related to municipal waste treatment in a Mechanical Biological Treatment (MBT) unit. The installation was elaborated by the company „Global Renewables”. The process is working in Sydney – Australia. All recyclable materials are separated and recycled, including biodegradable products. Following this process a large amount of carbon contained in the waste is converted in bio-available product by composting. Electrical energy is also produced.*

Key words: waste, composting, recycling, environment.

***Rezumat.** Lucrarea prezintă un studiu legat de stațiile de Tratare Mecanică și Biologică (MTB) a deșeurilor. Metoda a fost elaborată de firma „Global Renewables”. Procesul se aplică în Sydney – Australia. Toate materialele reciclabile sunt separate și reciclate, inclusiv produșii biodegradabili. Prin acest proces o cantitate mare de carbon conținut în deșeu este transformată în materiale bio-asimilabile prin compostare. Se produce, de asemenea, energie.*

Cuvinte cheie: deșeu, compostare, reciclare, mediu

INTRODUCTION

As the standard of living of people increases, there is a significant increase in the amount of waste that accumulates, resulting the need to address the problem of recycling in a new way that takes into account the evolution of mankind, in terms of raw materials and resource conservation energy

Addressing the issue of waste is a vital component of the principles of sustainable development. Worldwide there are concerns related to the optimization of the methods of waste treatment, in order to ensure the best possible recovery of materials and energy contained therein. The process developed by “Global Renewables” is a progress compared with other treatment processes because it involves integrated municipal waste treatment methods, ensuring a high recovery of waste in terms of economic efficiency.

MATERIAL AND METHOD

Modern waste processing units apply complex technologies involving mechanical and biological processes (Mechanical Biological Treatment - MBT) for separation and waste treatment.

In a first stage separation occurs in the main stream of waste recyclable materials. It is considering separating paper, plastics, glass and metals, which are then recycled by specific procedures.

Organic fraction of waste is subjected to a process of composting, obtaining a nutrient-rich compost. Typically, in the process of composting the temperatures are increasing enough in order to destroy pathogens. Biodegradable materials that can't be composted are subject to anaerobic degradation processes, in order to obtain biofuels. The obtained biofuels are used in order to provide thermal energy for the processes involved, and some of the biogas is used to produce electricity. Sand is also separated. In order to ensure economically and technologically efficient processes it is essential to assure the control of the process, so as to minimize the potential environmental contamination.

A modern treatment plant of municipal waste by mechanical-biological methods work in Australia where the process "The Urban Resource - Reduction, Recovery and Recycling Process® - UR-3R" is applied by Australian company Global Renewables' in association with the City of Sydney [1-4].

The 'UR-3R' is an integrated MSW plan for reduction, recovery, recycling (3R), accepting the full waste stream including green and food waste. Essentially is a mechanical-biological (MBT) separation and conversion process. The process utilizes advanced material sorting, the ISKA Percolation process, energy recovery (from biogas only), and composting [5].

RESULTS AND DISCUSSIONS

The application of the process proposed by the company Global Renewables' reduced by 210,000 tons per year the amount of carbon dioxide eliminated in the atmosphere and obtains an income of 11.6 M per year [1-11]. In parallel, a quantity of 30,000 tons of organic fertilizer for use in farms is produced. This compost improves soil quality assuring accelerated growth of crops, reintroducing a significant quantity of nutrients to agriculture.

Compacted or loose waste are handled and stored in a storage room which which is held at a negative pressure to prevent odours from escaping, and then manually sorted into three categories: paper, glass, plastic (sort itself in polyethylene terephthalate (PET), high density polyethylene (HDPE) and mixtures of plastics). Metal separation is made by means of electro-magnetic methods, plastic films and sheets of paper, by stripping drafts using cyclones. Recyclable materials are then sent to companies specialized in recycling.

After the separation of recyclable materials in mainstream material remained other organic materials and small pieces of materials. They are subject to a percolation process (extraction with water followed by filtration). Following this process the reduction of odor and of the quantity of organic waste takes places. The extract is subjected to anaerobic biological treatment process (digestion), separation of sand, denitrification, cleaning for removal of contaminants (broken glass, sand, and ceramics). Following anaerobic digestion process a fraction of biogas rich in methane (70% methane and 30% carbon dioxide, with small amounts of other gases such as hydrogen sulphide) are produced. After water separation, which is recirculated in the process, a stage of aerobic biological treatment of separated solid material at temperatures between

45-75°C takes places. Then follows a stage of maturation of compost that lasts up to eight weeks, separation the remaining contaminants, filtration, separation and packing oversized materials for distribution. Water should always be recirculated in the process so that installation does not require installation of additional drains or water treatment plants. The required energy is produced using the biogas produced in anaerobic biological treatment stage. Excess energy is sold to consumers.

The process stages with the mass balance are shown in Figure 1 [1]. One can noticed that from 100 tonnes of unsorted municipal waste 3,2 tons of metal, 7.2 tons of paper, 2.6 tons of glass and 6.8 tonnes of plastic are recovered. In parallel a quantity of 4.9 tonnes of biogas and 20.7 tons of compost are produced.

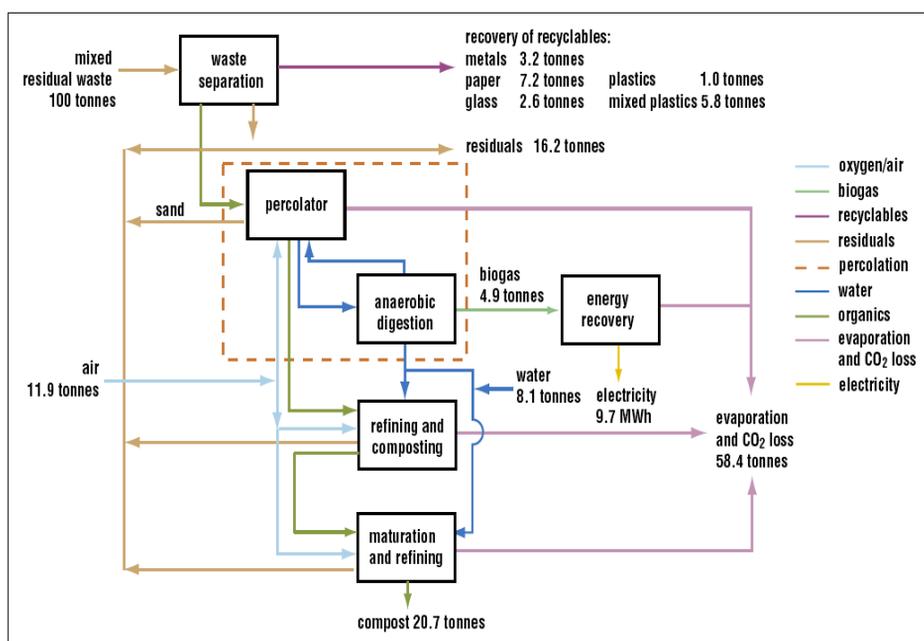


Fig. 1. The UR-3R Process®, showing mass balance of waste input and output. SOURCE: GLOBAL RENEWABLES GROUP [1]

The method presented in this paper can be a good example of municipal waste treatment, for the treatment plants that had to be elaborated. Starting from this example research programs has to be developed in order to establish the best solutions for waste treatments plants adapted to the specific composition of the waste from Romanian cities.

The process Ur 3R is also a very good example of integrated waste treatment method for teaching materials, in order to teach the state-of-the-art processes.

CONCLUSIONS

Application of mechanical-biological treatment methods of municipal waste is an effective method of recovery of materials and energy contained in municipal wastes.

The method proposed by the company Global Renewables' differs essentially from other methods that have become "classics" in economically advanced countries, by the way of approaching of the problem of organic waste.

In other methods, these wastes are either biologically degraded through anaerobic processes in order to obtain biofuels or are incinerated together with other waste with high calorific value.

The method proposed by the company Global Renewables' apply two types of biological treatment: anaerobic in order to obtain biofuels and aerobic, in order to obtain compost with high nutritional value. In parallel the recovery of other recyclable materials is assured. For this reason, municipal wastes are considered true "deposits" of which one can extract valuable materials.

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