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ScienceDirect

IERI Procedia 8 (2014) 2 – 10

Procedia IERI

www.elsevier.com/locate/procedia

2014 International Conference on Agricultural and Biosystem Engineering

# Pelletization of Compost for Energy Utilization

Ondrej Zajonc[a*], Jan Frydrych[b], Lucie Jezerska[a]

[a]*VSB-Technical University of Ostrava,17.listopadu 15/2172, 708 33 Ostrava, Czech Republic*
[b]*OSEVA Development and Research Ltd., Hamerska 698, 756 54 Zubri,Czech Republic*

**Abstract**

The presented paper tested pelletization of seven compost samples from six composting plants. If the produced compost meets the legal requirements for application to agricultural land, it is suitable for application in the soil. Low-quality composts that cannot be applied to soils or for which there is no demand can be energy utilized for co-incineration with fuels of high calorific value. Compost pelletization represents a type of processing that makes the handling of the material easier and enables more accurate dosing. Mechanical properties were determined for the produced pellets. The average durability of pellets expressed as the Pellet Durability Index was 94.1 %. The average pellet hardness expressed as the load value was 17.5 kg. The average value of moisture resistance expressed as the Wettability Index was 18.0 %. These pellets are of lower quality than pellets produced from spruce wood (*Picea abies* L.).


Selection and peer review under responsibility of Information Engineering Research Institute

*Keywords:* Compost, energy utilization, pelletization

## 1. Introduction

Composting represents an increasingly popular method of processing biodegradable wastes. Compost should be preferentially applied to the soil in order to increase its quality [1], [2], [3], [4]. Agriculture in many European countries is facing an interrupted carbon cycle and a decrease of soil organic carbon (SOC) [5].

* Ondrej Zajonc. Tel.: +420-597-329-431
*E-mail address:* ondrej.zajonc@vsb.cz.


Selection and peer review under responsibility of Information Engineering Research Institute
doi:10.1016/j.ieri.2014.09.002

Application of compost is one way to add total organic carbon to the soil [6]. During compositing, composts that do not meet the legal parameters for their use in agriculture and recultivation (content of harmful substances, insufficient quality) [7] are also produced or there is insufficient demand for the produced composts. If these composts meet the legal requirements, they may be used for energy utilization.

Energy utilization of composts is not intended for small incinerators (household boilers). One possible method of energy utilization of composts is their use in the form of pellets. Pelletization consists of adjustment of the material to a more compact form. The advantage of pelletization is easier handling, lower costs for transport [8] and more precise dosing to combustion device [9].

## 2. Material and methods

Energy properties of composts have already been studied in [10], [11]. Seven compost samples have been taken from six composting plants. Raw materials for the production of composts consisted mainly of wastes from the city greenery maintenance, sludge from waste water treatment plants and wood chips and one compost was produced within home composting [10].

The most problematic parameter for compost processing is moisture; the average moisture in the sample composts from the composting plants was 57.3 % (sampling was performed during winter). [10]. In order to be able to utilize composts for energy, they need to be dried to a value suitable for treatment and pelletization (10 - 30 % depending on the used treatment equipment). Before the pelletization itself, composts were dried in a laboratory drier to approximately 6 %. In practice, composts do not need to be dried to such a low value. After drying, the compost was crushed in the biomass hammer crusher Green Energy 9FQ 50. The average grain size distribution of composts is listed in Table 2. The pellet mixture was moistened to the suitable value and then pelletized.

Table 1. Entry raw materials of composts

| Compost sample labelling | Entry raw materials |
|---|---|
| Velka Polom | stabilized sludge from waste water treatment plants, wastes from plant production, wastes from animal production |
| Rymarov | 1 - grass, leaves, branches - chipping (wastes generated from city greenery maintenance) |
| | 2 - grass, branches - chipping (wastes generated from city greenery maintenance) |
| | 3 - grass, leaves, branches - chipping (wastes generated from city greenery maintenance), sludge from waste water treatment plant |
| Trinec (energy compost) | wastes generated from city greenery maintenance, wood chipping |
| Vratimov | compost produced in households. Entry raw materials: straw, hey, rabbit and sheep dung, sawdust, oat remains, potatoes, chicken dung. |
| Kuncicky u Basky | grasses, wastes generated from city greenery maintenance |

### *2.1. Compost pelletization*

A problematic parameter for compost pelletization is the moisture of the pelletized mixture. In the tested samples the optimum value for pelletization ranged between 25 - 30 % (vol.), from which it is clear that the samples needed to be dried before their energy utilization. The optimum humidity value depends on the compost composition. Composts were pelletized on the Green Energy JGE 120 pellet press. The pellets were then repeatedly dried in a laboratory drier. Finally, the monitored parameters were measured (durability,