



XVIIth World Congress of the International Commission of Agricultural and Biosystems Engineering (CIGR)

Hosted by the Canadian Society for Bioengineering (CSBE/SCGAB)
Québec City, Canada June 13-17, 2010



DETERMINATION OF PRESSURE DISTRIBUTION IN AN AERATED BED IN A CONTROLLED PILOT-SCALE COMPOST REACTOR

PIOTR SOLOWIEJ¹

¹University of Warmia and Mazury in Olsztyn, Poland, spitt@wp.pl

CSBE100778 – Presented at Section IV: Rural Electricity and Alternative Energy Sources Conference

ABSTRACT Composting biological waste is one of the most effective methods of its utilisation. Many studies have been carried out around the world into the possibility of utilising such materials as biological fractions of municipal waste or farm production waste. Studies into the possibility of recovering excess thermal energy produced in the process of composting biological waste requires the determination of the parameters of mass and energy transport stream in the aerated compost bed. A 100 dm³ adiabatic, leak-tight reactor, equipped with a controlled aeration system, was made for the experiment. The system enabled determination of the temperature and pressure distribution in the bed under examination. Sensors allow for determination of the amount and humidity of emitted gases under variable external physical conditions. Owing to the fact that bed aeration is carried out through the perforated bottom of the reactor, the mass (humidity) and heat are transported upwards, forced by the air pumped in and by natural convection. It would be extremely useful to know the pressure distribution inside the composted and aerated bed. The results obtained in the experiment have demonstrated the existence of significant differences in pressure for the selected places of the bed of the composted biological material. An upwards pressure increase in the heap was observed throughout the experiment. Pressure differences in the same plane of the bed were also noticeable. The results of the experiment should enable researchers to develop a model of mass and energy transport in a bed of material which is being composted. A separate issue which requires special attention and which affects the pressure distribution is the progressive change of the material density due to the physicochemical processes that take place in it. The change in density will have to be taken into account in the model.

Keywords: composting, energy, pressure