Abstract

Biogas represents one of the renewable sources of energy, which has been growing on use rapidly over the past decades. Biogas is produced during anaerobic digestion of organic material in biogas plants and it is most frequently used for heat and electricity production purposes. There are still plenty of unresolved questions as it is with the other renewable sources of energy. One of the most actual topics is the question of the subsequent usage of a digestate – side product of the biogas production process. Digestate is generally applied as an organic fertilizer for farmlands, but there are tendencies to use its solid phase for another energy producing processes or eventually as farm animal bedding, which is unfortunately connected with few problematic aspects such as transportation and storing of the biologically unstable material with high amount of water in it. Answer to those challenges could be provided by the bio-drying of the digestate´s solid phaze – substrate is dried up by heat produced during the microbial decomposition of organic matter and artificial aeration.

The main objective of the experimental part of this thesis was to comprehensively test the process of bio-drying of unmodified solid phase of digestate from different biogas plants with agricultural origin for the purpose of using it as an alternative fuel. Furthermore the testing was conducted as well on the solid phase of digestate from choosen biogas plant after optimization of its input composition. Optimization of the substrate before the process was focused on the increasing of dry matter content in the composition and C/N ratio by mixing with pre-dried solid phase of digestate and straw respectively. Based on the received results we can summarize that neither unmodified nor optimized solid phase of digestate was bio-dried enough for the purpose of using it as an alternative fuel. However there was an improvement in its organoleptic attributes – especially elimination of the unpleasant smell and therefore it is not excluded, that the investigated process could be more easily used for transformation of the solid phase of digestate into the farm animal bedding. The partial object of this thesis was to examine, whether respiratory activity of the microorganisms present in the solid phase of digestate could be a suitable indicator of usability of the bio-drying process. This assumption wasn´t positively confirmed due to anomalous test results from biogas plant Mokrovraty.

Key Words: Bio-drying, digestate, solid phaze of digestate, biogas, biogas plants