Duration of the biodrying process as a function of the initial moisture content of municipal solid waste

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Biodrying is a biological process, the goal of which is to sterilize and stabilize the organic component of municipal solid waste (MSW), reduce its moisture content, and increase the calorific value of the waste. Typical parameters that affect the efficiency of this process are the initial moisture content of the MSW, the aeration rate, the waste matrix temperature during the process, as well as the temperature and relative humidity of the air entering the bioreactor. Figure 1 shows the scheme of the bioreactor cell and the equipment used within this research to implement the biodrying process. The main mechanism in the biodrying process is convective evaporation caused by heat generated by the aerobic biodegradation and forced aeration.

Moisture content of the MSW is a critical factor that governs the duration of the biodrying process. Initial moisture content should be high enough to support microbial activities and biodegradation of organic matter while on the same time sufficient number of voids has to remain dry in order to support unrestricted oxygen transport through the waste matrix. Yang et al. (2014) suggested that optimal moisture content for effective biodrying is about 50-70% WM.

According to Velis et al. (2009), the biodrying process lasts between 7 and 15 days, while the biodrying process ends when moisture content drops below 20% (WM).

The main objective of this manuscript is to show how the duration of the biodrying process depends on the initial moisture content of the MSW sample. Figure 2 shows ~~five~~ six experimental results of biodrying process conducted under various initial moisture contents. Tests were carried out on MSW samples whose initial moisture content values ranged from 35 to 55% (WM). Obtained results reveals the existence of the strong linear relationship between initial moisture content and end of time of the biodrying process.

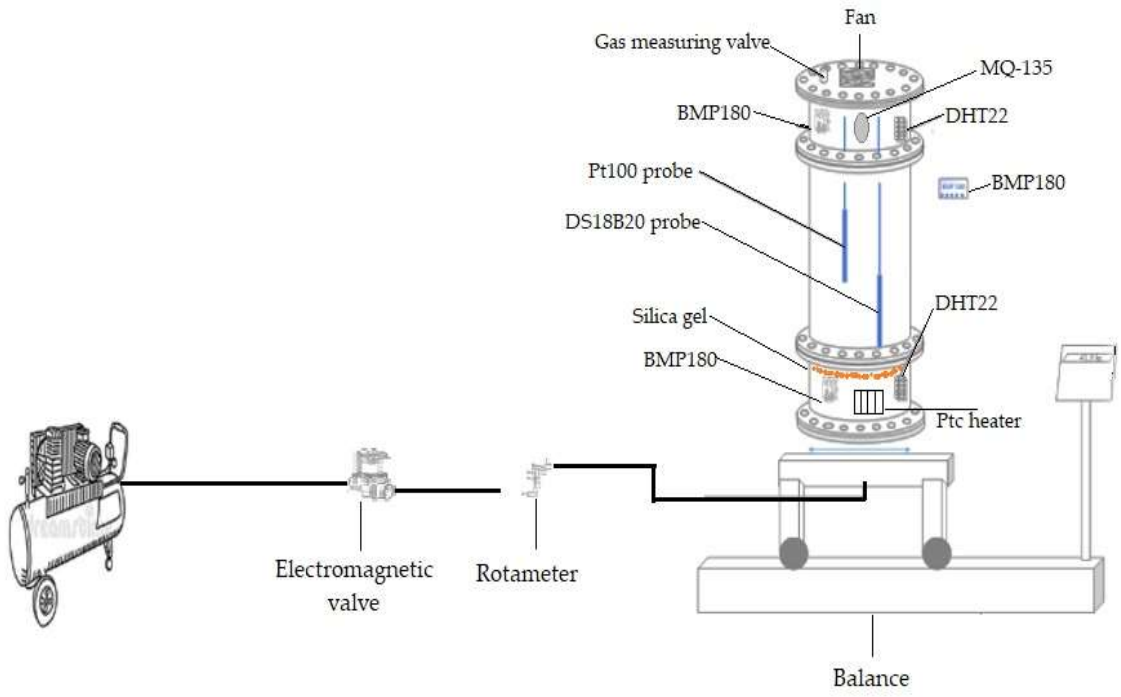
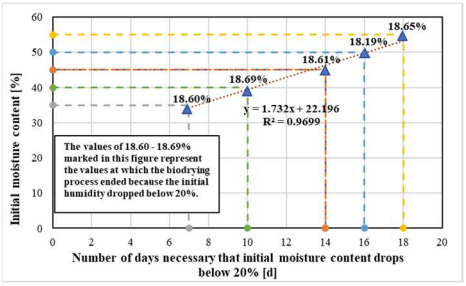
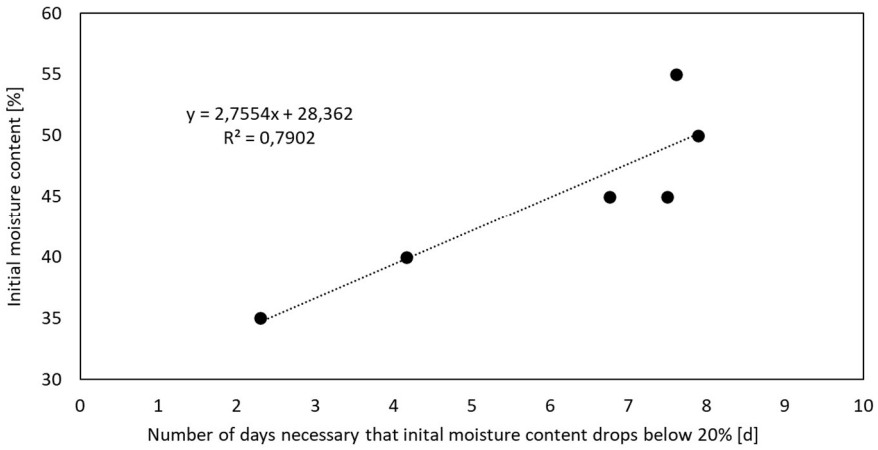


Figure 1. Bioreactor cell and equipment for biodrying (DHT22 – Arduino temperature and humidity sensor; BMP180 Arduino temperature and pressure sensor; MQ-135 Arduino gas sensor; DS18B20 Arduino temperature probe)



- ERROR – the number of days it took to drop the moisture content below 20% (WM) was incorrect. Consequently, the proposed linear relationship was also incorrect.



- CORRECTED

Figure 2. Relationship between duration of the biodrying process and initial moisture content of MSW

Key words: biodegradation; biodrying; moisture content; MSW; temperature

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