

Discussion

Test methods to aid in the evaluation of the diversion of biodegradable municipal waste (BMW) from landfill*

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Abstract

This discussion explores one crucial point about the use of biodegradability indicators to monitor biological processes in organic solid waste treatment plants. Today, some different measures are being used for the determination of biodegradable organic matter and most of them are based on respiration indices (oxygen consumption or carbon dioxide production under aerobic conditions) or biogas production tests (under strict anaerobic conditions). However, it is not evident from scientific literature that both tests may be equivalent or comparable. This discussion includes the results obtained when trying to correlate both anaerobic and aerobic tests to complement the recent work published by Wagland et al. (S.T. Wagland, S.F. Tyrrel, A.R. Godley, R. Smith. Waste Management 29 (2009) 1218-1226).

Keywords: biodegradability; biogas production test; respiration index; aerobic test; anaerobic test; municipal solid waste.

Discussion

The recent work published in *Waste Management* by Wagland et al. (2009) on the review of the test methods for the evaluation of the diversion of biodegradable municipal solid waste from landfill presents some important aspects related to the discussion of the suitability of such methods to measure the biodegradability of organic solid wastes. An interesting point of the paper is the comparison between aerobic and anaerobic tests and the possibility to obtain good correlations between oxygen consumption or carbon dioxide production (under aerobic conditions) and biogas or methane production test (under strict anaerobic conditions). I would like to complement the discussion about the possibility of correlating both indices by including some recently published data.

It is true that the excellent study published by Cossu and Raga (2008) offers the basis of the correlations between aerobic and anaerobic indices, but some of our recently published studies confirm that both types of tests, if properly managed, are very similar in their conclusions about biodegradability.

The first study is the one published by Ponsá et al. (2008), in which a complex mechanical-biological treatment plant treating mixed and source-selected municipal solid wastes (MSW) is monitored using both aerobic and anaerobic indices. The correlations are quite good, with a correlation coefficient of 0.94 between biogas produced during 21 days (GB21) and the static respiration index (RI). Moreover, the study shows an excellent correlation (coefficient of 0.9998) between biogas produced at 21 days and biogas produced at 100 days (GB21 and BMP100). In fact, biogas produced at 21 days corresponds to the 73% of the ultimate biogas production. However, further research is needed to confirm if shorter biogas assays can give a useful indication of the overall biogas potential. Our preliminary studies seem to confirm this. It is also important to highlight that the goodness of the correlation found between aerobic and anaerobic tests is maintained for wastes coming from all the biodegradation stages (from “fresh” wastes to stable compost). It is also interesting to notice that both aerobic and anaerobic tests are able to predict different biodegradability, as expected, from mixed and source-selected MSW.

Another very interesting work has been recently published by our group with the collaboration of Adani's team in Milan (Barrena et al., 2009). In this study, an exclusively aerobic mechanical-

biological treatment plant treating mixed MSW has been monitored in several moments of the stabilization process before going to landfill. Samples obtained have been analyzed for aerobic, anaerobic and chemical parameters. In general, correlations between aerobic and anaerobic indices are quite good (statistical significance was observed in practically all cases). However, a positive correlation between biological and chemical parameters was not found. This confirms one of the main conclusions stated in the paper by Wagland et al. (2009). The use of compositional methods such as dry matter or volatile solids content is a common practice in some countries (for instance, Spain) for the evaluation of the diversion of biodegradable municipal waste from landfill. In my opinion, from the scientific point of view, this should be reconsidered and simple biological biodegradability tests such as respiration indices should be implemented.

In conclusion, anaerobic and aerobic tests (both with advantages and disadvantages) are the most powerful tool to estimate the biodegradability of organic solid wastes. Scientific literature shows that they are the only way to monitor correctly the process performance and the final product stability in modern waste treatment plants.

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