Platform for **standardisation** of batch fermentation tests

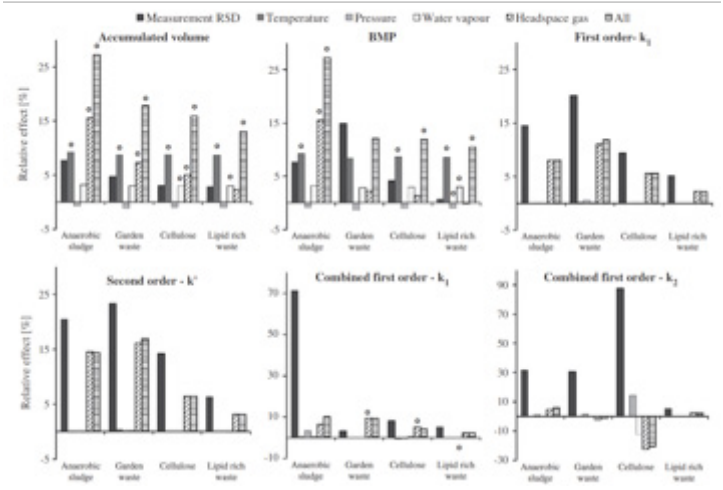
Fermentation test in batch procedures for various biological processes (e.g. anaerobic digestion, anammox, dark fermentation, ethanol fermentation, etc.) are increasingly recognised as key experimental approaches for research studies and industrial applications. However, due to the nature of the microorganisms used in such studies, the batch tests often generate high variability between different laboratories, mainly due to a poor standardisation in experimental platform, experimental procedure, data interpretation and presentation. As a consequence much research is focused on standardisation of these tests; in this regard the automated batch fermentation system AMPTS II and Gas Endeavour are excellent experimental platforms as they minimise the human input and automatically measures, calculates and presents the data in a standardised way.

Example 1

Study the influence of different process conditions in batch fermentation tests

The results of batch fermentation tests are influenced by a large number of important process conditions (e.g. substrate concentration, inoculum to substrate ratio, inoculum type, addition of a buffer solution, addition of nutrients, mixing, headspace volume and gas composition, etc), which all are important to consider for test standardisation.

For these kinds of studies the AMPTS II and the Gas Endeavour are ideal platforms as the automatic features with high measurement accuracy and precision makes it possible to simplify the test procedure and focus only on the process conditions of interest (Strömberg et al., 2014; Wang et al., 2014; Koch et al., 2015).



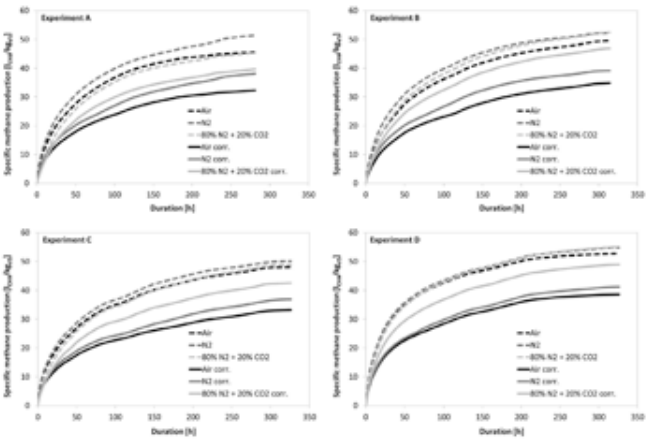
Factorial design effects of different experimental factors influencing the gas volume on various BMP test results (Strömberg et al., 2014).

Example 2

Improve certainty of results by investigating a range of experimental conditions

Different inocula and substrates often have varying optimal conditions and are generally difficult to characterise in detail. In order to reach a higher certainty of results it might therefore be prudent to investigate several experimental conditions (e.g. a range of inoculum to substrate ratios) to achieve the best possible test performance and thereby increase the confidence of the tests.

The AMPTS II is an ideal experimental platform to perform the necessary batch fermentation tests (e.g. BMP, SMA tests, toxicity test, etc.) as the simple operation of the system allows the user to screen many test conditions simultaneously.



Accumulated methane production of inoculum using different gases for the headspace flushing (Koch et al. 2015).

References

Koch, K., Bajón Fernández, Y., Drewes, J.E., 2015. Influence of headspace flushing on methane production in Biochemical Methane Potential (BMP) tests. Bioresour. Technol. 186, 173–178.

Strömberg, S., Nistor, M., Liu, J., 2014. Towards eliminating systematic errors caused by the experimental conditions in Biochemical Methane Potential (BMP) tests. Waste Manag. 34, 1939–48.

Wang, B., Nges, I.A., Nistor, M., Liu, J., 2014. Determination of methane yield of cellulose using different experimental setups. Water Sci. Technol. 70, 599–604.