

REAL's Research Hub

Project #4 – Project Brief

1 Project Title

Evaluation of the potential for the improvement of the Residual Biogas Potential test and investigation of alternative test procedures for PAS110 biofertilisers

2 Background

The Residual Biogas Potential (RBP) test is costly, requires a 28-day period from receipt by the laboratory, and can prove unreliable with respect to successful completion of the test or some of the test replicates. The time taken for analysis to be completed, and delay arising from a non-responsive test can cause considerable operational problems for the producers and undermine operator confidence in test results.

In addition, it is our understanding that this test is currently subject to review as part of the EA lead ADQP revision and as such may be subject to necessary change in the near future. There appears to be concern within the EA whether the RBP limits are sufficiently low to be considered fit for purpose, as digestate that has been dispatched from site has been considered to be still 'active'. This has raised potential concerns over the testing frequency and the benchmark levels for RBP test 'pass' for certification. If more rapid and cheaper tests were to be developed this would make more frequent testing of RBP a viable option.

3 Project Definition

This project has five broad objectives:

- I. To seek to identify any patterns with respect to test failures and non-responses, for example nature of feedstock, time of year, lab inoculum source, etc.
- II. Investigate whether it is possible to predict the 28-day result by analysis earlier in the RBP test procedure.
- III. Investigate the efficacy of using different inocula in the standard test to achieve greater reliability as a way forward if alternative tests cannot be identified.
- IV. Investigate whether there are any alternative procedures which might replace the standard RBP test. The EU in its Fertiliser Regulations recommends *BS EN 16087-1:2020, Soil improvers and growing media. Determination of the aerobic biological activity. Oxygen uptake rate (OUR) for both fresh crop digestate and other digestates.*
- V. Investigate whether there are any alternative rapid procedures to evaluate digestate stability and residual biogas potential.

3.1 Project Outcomes

This project seeks to evaluate the potential range of procedures to evaluate digestate stability.

Objective 1 will be achieved by data analysis from producers and lab service providers.

Objective 2 will require experimental analysis. Howell et al. 2019 J. Env. Mgmt 887-894 have investigated prediction of 28-day biogas production from analysis earlier in the experimental cycle for Municipal Biowaste. This will be repeated for PAS110 waste streams.

Objective 3 will require comparisons of the test outcomes using different inocula with digestates derived from differing feedstocks.

Objective 4 will investigate the OUR test which is identified in the EU Fertiliser Regulations as an alternative to the RBP test as a determinant of the stability of the digestates. Assessments of the stability of digestates from a range of feedstocks should be compared using the two assessment procedures.

Objective 5 will investigate procedures that are available to rapidly predict biogas potential by detailed analysis of digested materials (e.g., Bullet BMP). These procedures take homogenised samples and use Near Infrared (NIR) technology which measures the molecular bond vibrations in the sample to determine Biomethane Potential of fresh digester feedstocks against a calibration model.

The calibration model is based on a large data set including a range of sample types (municipal solid waste, green waste, energy crops, manure, biosolids and agricultural residues). Results are provided with 7 days of receipt of the sample. To date these procedures have not been used to test biogas potential at the end of the digestion process and sample preparation would need to be adjusted to be applicable for the digestate at the end of the process. The potential of this NIR procedure will be tested against the standard PAS110 specified procedures and the OUR procedure and its efficacy evaluated for a range of feedstocks.

3.2 Project Deliverables

- ❖ A greater understanding of the potential variabilities in the outcomes of the RBP test with digestates from a range of feedstocks and inocula will provide a fuller understanding of the uncertainties which may occur with the test and inform the interpretations of test results.
- ❖ The comparison of the RBP and OUR tests will provide the possibility of a robust alternative to the RBP test.
- ❖ The efficacy of NIR procedures currently used in prior testing of feedstocks to evaluate gas yield potential will be investigated as a post digestion procedure to assess stability of the digestate.
- ❖ Increased confidence amongst the community of digestate producers on the robustness of the RBP test. Potential to incorporate any new requirements specified by the ADQP revision.

