

Anaerobic digestate dewatering performance monitored using low-field ^1H NMR relaxometry

E.G. Bertizzolo¹, N. Ling¹, F. Tessele², M. L. Johns¹, E. O. Fridjonsson¹

¹School of Engineering, Department of Chemical Engineering, The University of Western Australia, Crawley, Australia, ²Tessele Consultants, Attadale, Australia

Abstract

A growing challenge of industrial waste management is the large industrial-scale conversion of organic waste into valuable resources. For the transformation of anaerobic digestate (AD) into bio-based fertilizer [1] the de-watering step, via flocculation and mechanical dewatering, necessitates precise monitoring. Here we present low-field NMR relaxometry (T_2) results (see Fig 1) used to non-invasively track the change in digestate structure in response to varying flocculant dosing [2]. A series of NMR experiments were performed during flocculation and after mechanical de-watering for a dosing range of 0 to 5.25 wt%. Results show that monitoring AD samples during the flocculant dosing phase performs well at predicting solid's cake structure, and therefore de-watering performance, after the mechanical de-watering process. These findings encourage further exploration of low-field NMR to monitor similar solid-liquid separations of industrial digestate, and to allow for further assessment of low field NMR relaxometry as a monitoring tool for optimal flocculant dosage prior to mechanical de-watering.

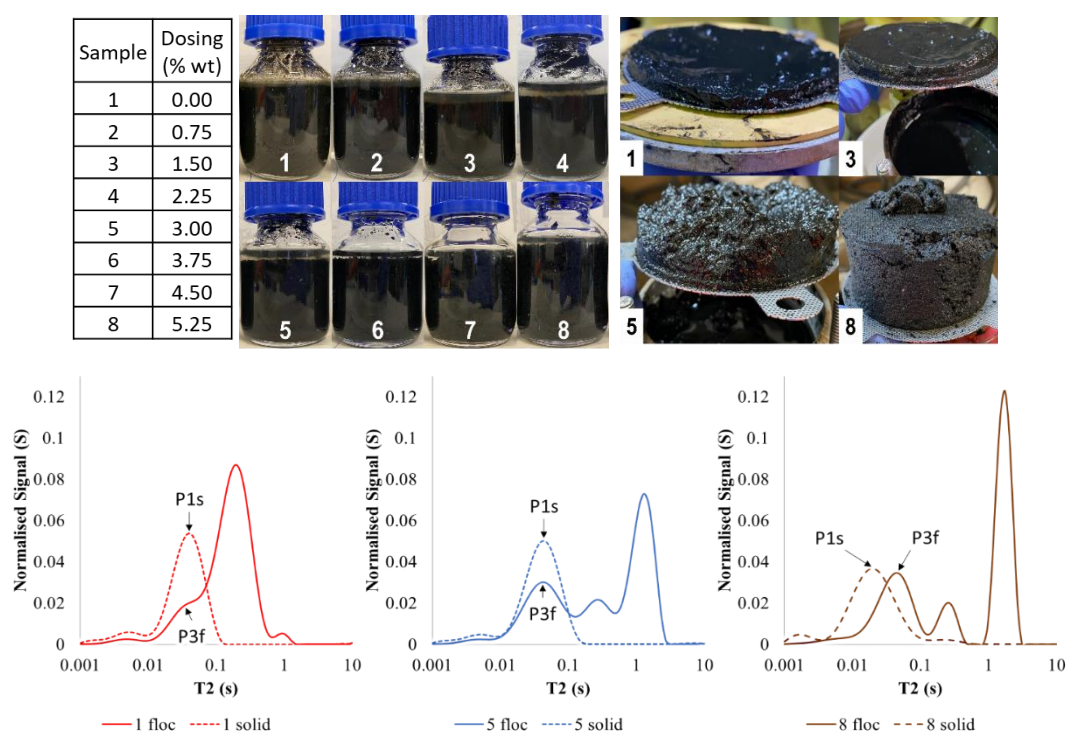


Fig. 1. Shows (a) flocculant dosing used, (b) photo collage of flocculated samples, (c) resulting solid's cake highlighted (Sample 1, 3, 5 and 8) after mechanical de-watering. (d) T_2 relaxation distributions for sample 1, 5 and 8 for flocculated (f, floc) and mechanically de-watered (s, solid) samples.

References:

[1] Ramirez *et al.* (2021), Animal Production Science, **61**, 541-550. [2] Bertizzolo *et al.* (2023), Water Research, **245**, 120660.