Sludge dewatering and drying: about the difficulty of making experiments with a non-stabilized material

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Received 20 February 2014; Accepted 5 June 2015

ABSTRACT

Due to increasing amounts of wastewater bio-sludges produced worldwide, a lot of research has been carried out to optimize their treatment in view of reducing their high water content. Large efforts have been made on bio-sludge conditioning prior to mechanical dewatering. Research about drying is more recent but becomes more and more important in order to produce pellets that can safely be used in agriculture or that can be incinerated to recover energy. The consequences of the dewatering step especially, the nature and dosage of the polymer used for conditioning, on further drying still need to be investigated. However, such studies require making a large number of experiments at the laboratory scale, which needs to use a liquid bio-sludge with constant properties in order to get relevant results. Within this context, this article emphasizes the difficulty of making experiments with an organic material, by showing dewatering and drying results obtained during two series of tests. The experiments were conducted with bio-sludge collected after thickening in a local wastewater treatment plant. During the first test series “W,” experiments, i.e. conditioning, dewatering and drying, were performed on three samples with one week apart, using the same initial bio-sludge. For the second series “D,” trials were done each day during a working week. The Zetag 7587 conditioner was used to evaluate bio-sludge flocculation behaviors. The dewatering was made using a normalized filtration-expression cell. Drying experiments were carried out in a convective micro-dryer. The results indicate that an increase in storage duration leads to changes in bio-sludge dewatering and drying behaviors, leading to poor repeatability of experiments. Consequently, any experimental design must be completed in a limited time span to obtain relevant results. About shrinkage response which develops during drying, a two-zone linear model was developed. It was observed that the first part of the curve was almost similar for all experiments, whereas the second part reached progressively to lower volumes with increasing storage duration. In future works, the impact of other polyelectrolytes’ type and dosage at the laboratory scale on the dewatering and drying processes will be investigated more deeply.

Keywords: Wastewater bio-sludge treatment; Bio-sludge flocculation; Dewatering; Convective drying; X-ray microtomography