

Enhancement of waste sludge disintegration by ozone combined with ultrasound pre-treatment

Mireia Fiter¹, Albert Canut¹, Begoña Ruiz¹, Carlos Ferrer² and Andrés Pascual¹

¹ ainia Technological Centre, Parc Tecnològic de València, C/Benjamin Franklin 5-11, E-46980 Paterna, València, Spain.

E-mail: mfiter@ainia.es; acanut@ainia.es; bruiz@ainia.es; apascual@ainia.es

² FACSA, C/Mayor, 82-84, E-12001 Castelló, Spain.

E-mail: cferrer@facsa.com



Introduction

The processing and disposal of wastewater treatment sludge is a problem of major concern in terms of environment, finance and technology. The most traditional method to reduce sludge volumes is anaerobic digestion (Weemaes *et al.*, 2000).

Recently, a lot of interest has been devoted to sludge disintegration and solubilisation techniques to cope with the biological limitations in terms of degradation of particulate matter (Odegaard, 2004).

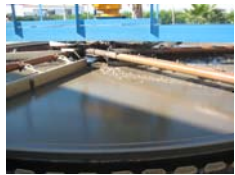
Objective

In this study, a combination of oxidative and mechanical treatment of sludge is investigated in order to enhance its disintegration and improve the subsequent anaerobic digestion.

The sludge is, simultaneously, ozonated and sonicated so that high solubilisation is achieved improving its biodegradability and allowing for higher biogas production rates.

Experimental Setup

Castelló de la Plana WWTP

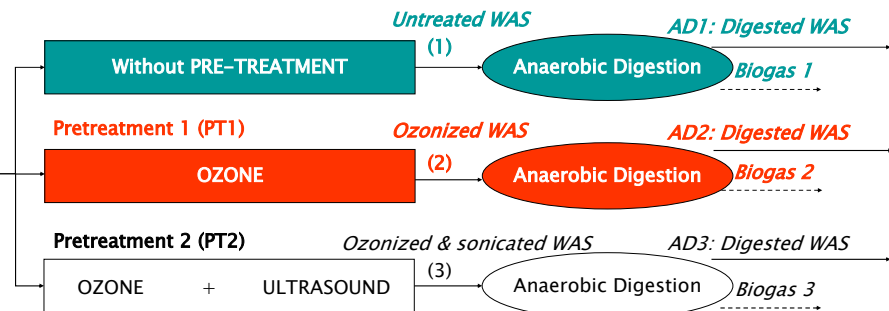


Ozone (PT1)



Ultrasound (PT2)

Thickened WAS
(Waste Activated Sludge)



OZONE (PT1) tests in progress.

OZONE+ULTRASOUND (PT2) tests planned to start in May 2010.



Anaerobic Digestion (AD)



Biogas counter

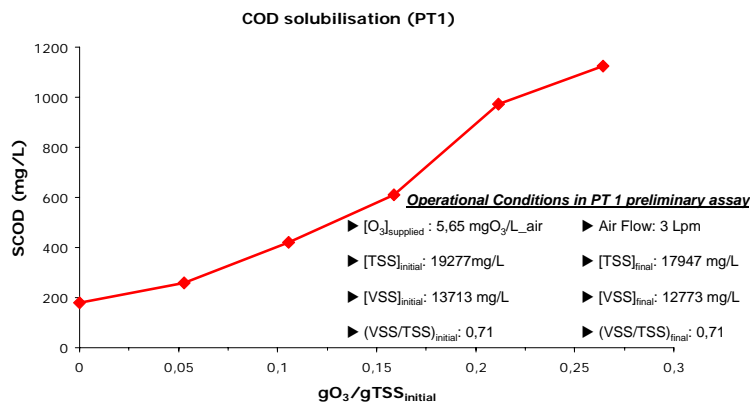


Digested WAS

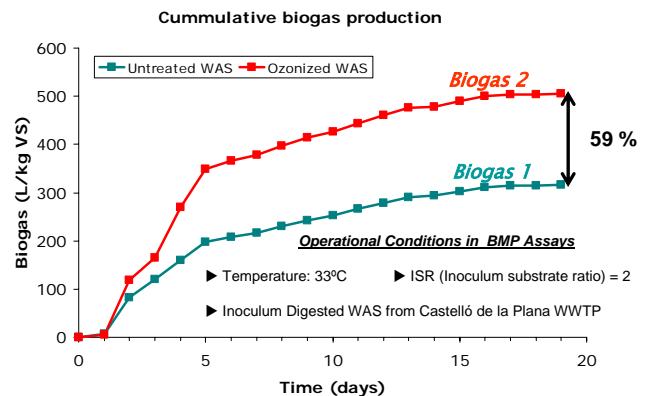
ANAEROBIC DIGESTION batch tests with Untreated WAS and Ozonized WAS in progress

Preliminary Results

Pre-treatment 1 (PT1): WAS disintegration by ozone



Anaerobic Digestion (AD1 & AD2): Biomethane Potential (BMP) Assays



In order to evaluate economical aspects, the relationship of specific energy expressed as power requirement (kWh) (from PT1 and PT2) per kg of SCOD (soluble Chemical Oxygen Demand) increase will be related to the biogas production and sludge mass residue from anaerobic digestion.

Conclusions

Based on the WAS disintegration study proposed, conclusions may be expected in relation to:

- 1) ozone and ultrasounds requirements;
- 2) TSS disintegration and COD solubilisation efficiency;
- 3) specific ozone consumption;
- 4) sonication conditions;
- 5) biogas production;
- 6) sludge mass residue reduction;
- 7) economic evaluation.

With the combination of ozone and ultrasounds pre-treatments, an enhancement of anaerobic sludge digestion in terms of biogas production and sludge digested minimization is expected taking into account economical profits.

References

- Odegaard, H. (2004). Sludge minimization technologies – an overview. *Wat. Sci. Tech.*, **49** (10), 31-40.
- Weemaes, M.; Grootaerd, H.; Simoens, F. and Verstraete W. (2000). Anaerobic digestion of ozonized biosolids. *Wat. Res.*, **34** (8), 2330-2336.