CONDITIONING SEWAGE SLUDGE IN WWTPs IN THE PROVINCE OF CORDOBA WITH TECHNOLOGY ATAD

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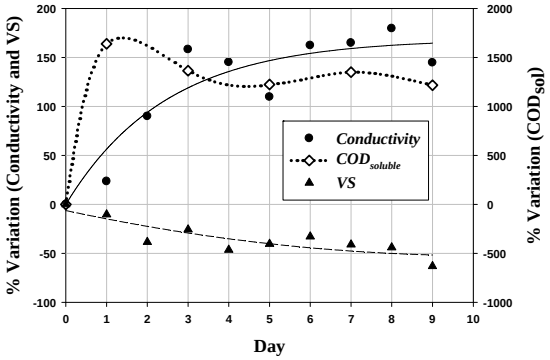
Topic 2.2. Environmental Technology

The third draft of the European Directive on spreading of sludge on land try that its application on land does not have any risk for the soil and crops. In this context it is necessary an advanced process capable of producing the simultaneous decrease in moisture and waste stabilization in terms of reduction of organic matter including microbial inactivation. Among the processes set out in the working paper, thermophilic aerobic digestion (> 55º C) could get these standards. Therefore, the aim of this paper is to evaluate the performance of a pilot scale reaction system ATAD (autoheated thermophilic aerobic digestion) compared to the stabilization and sanitation of sludge mixed from the wastewater treatment plant of Cordoba province (Spain) to allow its incorporation into ground as consider future European Directive.

Experiments were conducted in a 0.4 m^3 reactor (usable volume), equipped with an air injection system Venturi-type that achieves twofold aim: the excitement of mixing and aeration of organic matter. Preliminary tests have resulted in the determination of optimal temperature range for sanitation (between 55-71º C) being the hydraulic retention time (HRT) inversely proportional to the temperature reached (HRT between 14 and 7 days). The critical variables for thermophilic aerobic digestion has been the organic matter concentration in the influent (> 50% VS, volatile solid) and the oxygen concentration (to maintain a minimum of 1 mg O_2/L). During the pilot phase of boot the intensity of aeration and HRT have varied. The first experiments with high residence times and low aeration failed to reach the thermophilic regime (> 55 ºC) and finally it was observed the best operating condition is the HRT is close to 7 days. Under these conditions have been achieved elimination at the approach yields a semi-steady state of 76% for COD_{total} (total chemical oxygen demand), 63% for VS, 56% for TS (total solid) and 77% for TSS (total suspended solid), increasing the conductivity in the mixed liquor in more than 170% and 1220% in the case of COD soluble.



	Inlet	Outlet
pH	6.78	6.85
Conductivity (mS/cm)	2.77	6.43
$COD_{soluble}$ (mg/L)	795	43,340
COD (mg/L)	50,360	12,050
TS (mg/L)	67,705	44,560
VS (mg/L)	33,010	12,213
μ_a (cps)	1446	135

The resulting product show improved stability as it was assessed by respirometry (with accumulated oxygen consumption <48 mg O_2 / g VS·day, in comparison to 60 mg O_2 / g VS·day in the influent sludge) and reduced microbial contamination (<1000 cfu of *E. coli*/g d.m. and 4 log - reduction, <3000 spores *Clostridium perfringens*/g d.m., well absence of Salmonella in 50 g d.m.). The digested sludge has a viscosity (at 25°C), ten times lower than the influent, making it difficult its dehydration with spin drier, which has been experimentally quantified by an increase of 26% in polyelectrolyte consumption. Finally, this technology allows significant dry matter reduction to be reached, which is translated into savings on the final management system which reduces the HRT compared to anaerobic digestion or composting process, allows automation and recovery as agricultural amendment, making it the most suitable system for the integrated management of sludge in the plant for volume lower than 20,000 eq-hab.