Biotechnological processes for water and energy saving

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Anaerobic-based (waste)water treatment facilities producing biogas, possess multifunctional characteristics: besides nutrients and raw materials like sulphur, energy and water are recycled. Therefore, biogas either for power production or vehicle transport is one of the clearest examples of synergy between water and energy sectors.

From the beginning of the eighties, high-rate anaerobic wastewater treatment technology (HR-AnWT) has become a standard for a certain range of biodegradable industrial wastewaters, including those from distilleries, pulp and paper, breweries and beverage industries. However, complex wastewaters with high lipids content are not effectively treated by HR-AnWT. On the other hand, addition of waste lipids to an animal waste-based biogas plant, without a proper feeding strategy, is risky, if accumulation of long-chain fatty acids (LCFA) is not prevented. Nevertheless, waste lipids are ideal substrates for methane production, since theoretically their degradation produces more biogas with higher methane content, when compared with proteins or carbohydrates. The energy value of lipids makes them an ideal co-substrate to increase the economical feasibility of any AD plant based on co-digestion concepts. The existing gap in HR-AnWT for complex wastewaters with lipids and the importance of lipids as co-substrates in AD plants make this issue of global interest in the environmental biotechnology field. New concepts to avoid inhibition by lipids and to enhance its degradation are presented. The research route, from lab-scale basics [1], to technological development [2], scale-up, and pilot testing is presented in this communication.

[1] Alves, M.M., Pereira, M.A., Sousa, D.Z., Cavaleiro, A.J., Picavet, M., Smidt, H., Stams, A.J.M. (2008) Waste-lipids to energy: how to optimize methane production from long chain fatty acids (LCFA). Microbial Biotechnology (in press).

[2] Alves, MM, Picavet, MA, Pereira, MA, Cvaleiro, AJ, Sousa, DZ."(WO/2007/058557) "Novel anaerobic reactor for the removal of long chain fatty acids from fat containing wastewater".