

Anaerobic Digestion: about Beauty and Consolation

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Science and development is driven by the struggle to learn to understand complex features and the beauty when one succeeds to find transparent answers. In this context, the AD microbiome is a most attractive topic because it is based on a very intricate cooperation of a variety of microbes, which in a dynamic way bring about an overall process of utmost elegance. The key question to be addressed at this moment is: at what level (um/mm/cm) and how (electro-wired resp metabolo-connected) is the methanogenic microbiome organized.

Science and development is also driven by the fact that it deals with matters which cannot be ignored. In that context, the AD technology is experiencing major transitions. First of all, it becomes a crucial process in terms of the abatement of climate change. Secondly, it has a central role in the development of the biorefinery. Indeed, certain of its process steps can help upfront to produce valuable products. It can also be the central operational platform of the treatment. For instance, it is predicted that AD will become soon the central process of the sewage factory. More than before, AD is of strategic importance in the approach to harvest high value products such as polymers and even protein from low quality sub-streams. A third development of interest is the putative connection of AD and the petrochemical industry. The latter is looking for a greener image and by various techniques to upgrade biogas, a bridge between the bio- and the petro-chemistry is possible which offers long-term perspectives for producing a multitude of commodities from renewable resources.

The technological progress that AD actually experiences in the field is remarkable. The MBR technology for industrial waters and also for sewage offers new perspectives. The treatment of saline sewage via a clever anaerobic microbiological process is gradually coming possible. The combination of physico-chemical 'cracking' of organics to achieve more biogas gets integrated in practice. Gradually, the clear-cut advantages of dealing with the combination of AD-Composting for the organic fraction of municipal solid wastes get recognized as best available technology. And most of all, worldwide, AD is no longer the ugly duck but a real mature technology capable to generate per unit up to several digits of MW of power, and for a country or region able to total energy production levels equivalent to that of nuclear power plants.

Yet, all of us dealing with AD are regularly in need of consolation. We keep wondering about questions such as the relation between metagenomics and the functioning of the AD microbiome, the potential of effectively manipulating that microbiome eg by means gene transfer or synthetic biology, the possibility to alter the surface characteristics of the flocs and granules, the absence of unequivocal early warning indexes, the sense of supplementation with trace metals...

Overall, AD in 2013 is more dynamic than ever and also more beautiful than ever before, because of its baffling potentials and its ever increasing complexity.