The state-of-the-art of anaerobic treatment of sugarcane vinasse

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Vinasse (*slop, stillage, dunder*…) is the main waste of alcohol distilleries and is produced at reason of up to 13 liters per liter of alcohol distilled. Brazil is the second largest alcohol producer and consumer in the world, thus produced about 24 billion liters of alcohol in 2007/2008, which represents nearly 312 billion liters vinasse. Generally, sugarcane vinasses are rich in mineral nutrients such as potassium, calcium and sulfur and have a high content of organic matter, characterized by elevated levels of BOD and COD. Owing to these characteristics, vinasse has been used as an organic fertilizer: the application in agricultural soils is employed as a land treatment system which may remove most nutrients present in the vinasse. This is a common practice in Brazil, Eastern Europe and in some of the western European countries. However, some investigations have indicated that land disposal of vinasse may lead to groundwater contamination, mainly because of inappropriate disposal practices which are difficult to control, and may also produce obnoxious odorant emissions due to the organic matter putrefaction. Due to the issues presented above, the anaerobic treatment is attractive when compared with other treatment alternatives. In literature, good results for COD reduction have been reported (up to 95,9%). Besides the efficient organic matter removal, the anaerobic digestion of vinasse produces biogas, which may be used as an energy supply in the ethanol plant, and biofertilizer, which may substitute the raw vinasse soil application. Estimations shows that the Brazilian potential for biogas production from vinasse is around 2.052.960.000 $N.m^3.year^{-1}$. However, the anaerobic treatment is still considered by many as an inefficient process with unsolved problems, such as slow start-up and instability issues. The aim of this paper is to assess the advances, challenges and opportunities of applying state-of-art technologies for the anaerobic treatment of vinasse.