The possibility of producing biomethane from municipal solid waste in Kocaeli

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Management of municipal solid waste (MSW) is a big problem for municipalities. Handling of MSW is commonly accomplished by landfilling. Unfortunately landfilling of MSW causes spreading of diseases, contamination of underground water sources and increases greenhouse gas emissions. Anaerobic fermentation can overcome these harmful side effects of landfilling. Biomethane production from anaerobic fermentation of organic substances is studied extensively in the recent years. Since 42% (dry basis) of the MSW produced in Kocaeli consists of organic substances, anaerobic fermentation seems to be a more efficient way to manage MSW. The objective of this study is to analyze the characteristics of MSW in Kocaeli and develop an adequate process to convert MSW to biomethane. Its thought that dry fermentation is a proper way to handle MSW and produce biomethane instead of wet fermentation. Total Solids Concentration in wet fermentation and dry fermentation is 10% and 35%, respectively. With this higher ratio of Total Solids Concentration in dry fermentation, better handling of MSW can be achieved. 1500 ton/day MSW is disposed in Kocaeli in 2012 and 270 ton/day of this MSW is organic waste. It is calculated that approximately 40,000 m^3/day biogas and 6 MW electricity can be produced from organic MSW, with respect to experimental data.

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Zero energy buildings rehabilitated for low energy demand by using solar and biomass energy

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The European Directive 2010/31 indicates that profitable models should be prepared for the transformation of existing buildings in Nearly Zero Energy Buildings (NZEB). In the present study we proposed a methodology that based on current market technologies using biomass and solar energy to achieve high levels of energy efficiency (minimum class A in the current Spanish legislation). The proposed model is aimed to improve thermal insulation, the installation of new heating systems, equipments (biomass boiler, VRV, etc.) and the installation of solar panels. We developed a virtual model of a building through Revit Architecture (BIM) by evaluating the energy consumption using Energy-Plus (DOE2) and computing the facilities. Then the building energy ratings, before and after rehabilitation is obtained The study demonstrated that the objective of NZEB using the current technology is possible for the reduction of CO_2 emissions to 0% by using renewable energies with 100% as building electricity demand.

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Bioprocessing of *Brevibacillus brevis* and *Bacillus polymyxa*: a potential biocontrol agents of gray mould disease of strawberry fruits

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Gray mold, caused by *Botrytis cinerea* is one of the important strawberry disease that causes losses before or after harvest wherever strawberry. The effects of preharvest spray with promising bacteria, that is, *Bacillus brevis* and *Bacillus polymyxa* on gray mould and quality of strawberry fruits preharvest and postharvest were evaluated. In "*in vitro*" assays cells and their filtrates of both isolates strongly inhibited *B. cinerea* growth. Moreover, liquid chromatography–mass spectrometry analysis was carried out to identify the antifungal components of the most effective culture filtrates against gray mold pathogen. *Bacillus polymyxa* and *B. brevis* were found to produce large amounts of peptide polymxin B and gramicidin S, respectively. In order to standardize the mass and metabolite production some cultural conditions like different incubation time in hours, pH, carbon sources and concentrations and nitrogen source were determined. During fermentation, growth, pH and antibiotics production were monitored. Preharvest application of liquid formulation of culture filtrates of certain microbial isolates provided an effective control of fruit gray mould disease pre and protect fruit during storage than the tested fungicide at the recommended levels. These results suggested that integration of preharvest spray with biocontrol may be a promising management strategy for decay control and quality maintenance of strawberry.

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Experimental investigation of biomethane production from cheese whey in one and two staged digester

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Biomethane is considered to be a sustainable and renewable natural gas source and in the recent years, biomethane production processes studied extensively. Anaerobic fermentation is one of the way of producing biomethane. In this study, with a test system consists of 50 l and 80 l reactors that can work as one and two staged, biogas production via anaerobic fermentation of cheese whey under mesofilic conditions is investigated experimentally. In both experiments, cheese whey is mixed with cow and poultry manure with 6% dry matter ratio (DMR) and fed to system with 2 kg/day and methane production rates are logged. For the one staged biogas production 80 l reactor is used and methane production rate is found to be 571.4 l CH_4/kg VS. On the other hand, for the two staged biogas production, 50 l (R1) reactor is used as acetogenesis reactor and 80 l (R2) reactor is used as methanogenesis reactor and methane production rate is found to be 595 l CH_4/kg VS. With these experimental results, it could be considered that methane production rate is stayed approximately constant in both one and two staged systems. It is more effective to use one staged system instead of two staged system because of the instable pH in the acetogenesis reactor in two staged system which causes operational problems.

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