Special Issue List in Section

Feature Papers in Bio-Energy
Guest Editors: Prof. Dr. Fernando Rubiera González, Dr. Covadonga Pevida García
Deadline: **30 September 2020**

Renewable Energy Production from Energy Crops and Agricultural Residues
Guest Editor: Dr. Luigi Pari
Deadline: **25 September 2020**

Energy Valorization of Sustainable Biomass and Bioresidues
Guest Editors: Dr. VItaliano Chiodo, Dr. Mauro Prestipino, Prof. Dr. Antonio Galvagno
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Optimization of Biodiesel and Biofuel Process
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Deadline: **20 October 2020**

Production and Utilization of Biogas 2020s
Guest Editor: Dr. Wojciech Budzianowski
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Analysis of Bio-Based Products for the Circular Economy
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Wastewater Treatment and Resource Recovery
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Anaerobic Digestion of Organic Waste: State of the Art and Future Perspectives and Challenges
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Deadline: **31 December 2020**

Biomaterials and Biofuels: Small Environmental Footprint
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Deadline: **31 December 2020**

Cold Plasma Assisted Biorefining and Chemical Processes
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Deadline: **15 January 2021**

Advanced Technologies for Biomass
Guest Editors: Prof. Dr. Andrea Di Carlo, Dr. Elisa Savuto
Deadline: **10 February 2021**

Bioeconomy for Resilient Post-COVID Economies
Guest Editors: Prof. Stelios Rozakis, Prof. Dr. Luka Juvančič
Deadline: **20 March 2021**

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Section **Bio-Energy**

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Section Information:

In recent decades, there has been a constant growth in the world's energy demands, mostly supported by fossil fuels. This has resulted in an associated increase in CO2 emissions and a growing concern about the consequences of climate change and global warming, which represent a major threat to the wellbeing not only of humankind but also of our planet. Thus, there is an increasing interest in developing new technologies to produce energy from renewable sources, such as biomass, in a high-energy efficient, cost-competitive, and environmentally friendly manner. The production of bio-energy from biofuels offers several advantages, as it will reduce the energy production impact of the greenhouse effect and global warming due to its CO2 life-cycle neutrality; likewise, unlike most other renewable energy sources, bio-energy can generate both heat and electricity with high efficiency in combined heat and power (CHP) plants.

Transport is the third-largest source of CO2 emissions after the power and industrial sectors, with road transport being the biggest contributor followed by aviation and shipping. Reducing the emissions of the transport sector is likely to be more challenging than for other sectors; thus, key developments in the transport sector will have to include higher use of biofuels produced in a sustainable manner, including biojet fuels suitable for aircrafts, in accordance with the sustainable development scenario of the IEA.

The Bio-Energy Section is primarily focused on regular and review papers related to all aspects of bio-energy production and use, including treatment of feedstocks, biomass conversion technologies, all range of biofuels for vehicles, and new trends and latest discoveries for promoting the use of aviation biofuels.

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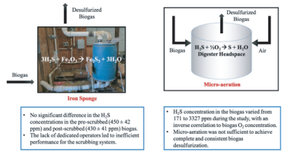
Featured Papers

DOI: 10.3390/en12244605

Evaluation of Hydrogen Sulfide Scrubbing Systems for Anaerobic Digesters on Two U.S. Dairy Farms

Authors: Abhinav Choudhury, Timothy Shelford, Gary Felton, Curt Gooch and Stephanie Lansing

Abstract: Hydrogen sulfide (H_2S) is a corrosive trace gas present in biogas produced from anaerobic digestion systems that should be removed to reduce engine-generator set maintenance costs. This study was conducted to provide a more complete understanding of two H_2S scrubbers in terms of efficiency, operational and maintenance parameters, capital and operational costs, and the effect of scrubber management on sustained H_2S reduction potential. For this work, biogas H_2S, CO_2, O_2, and CH4 concentrations were quantified for two existing H^2S scrubbing systems (iron-oxide scrubber, and biological oxidation using air injection) located on two rural dairy farms. In the micro-aerated digester, the variability in biogas H_2S concentration (average: 1938 ± 65 ppm) correlated with the O_2 concentration (average: 0.030 ± 0.004%). For the iron-oxide scrubber, there was no significant difference in the H_2S concentrations in the pre-scrubbed (450 ± 42 ppm) and post-scrubbed (430 ± 41 ppm) biogas due to the use of scrap iron and steel wool instead of proprietary iron oxide-based adsorbents often used for biogas desulfurization. Even though the capital and operating costs for the two scrubbing systems were low (<$1500/year), the lack of dedicated operators led to inefficient performance for the two scrubbing systems.

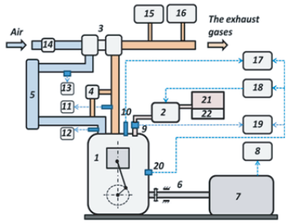


DOI: 10.3390/en12152978

Research on the Combustion, Energy and Emission Parameters of Various Concentration Blends of Hydrotreated Vegetable Oil Biofuel and Diesel Fuel in a Compression-Ignition Engine

Authors: Alfredas Rimkus, Justas Žaglinskis, Saulius Stravinskas, Paulius Rapalis, Jonas Matijošius and Ákos Bereczky

Abstract: This article presents our research results on the physical-chemical and direct injection diesel engine performance parameters when fueled by pure diesel fuel and retail hydrotreated vegetable oil (HVO). This fuel is called NexBTL by NESTE, and this renewable fuel blends with a diesel fuel known as Pro Diesel. A wide range of pure diesel fuel and NexBTL100 blends have been tested and analyzed: pure diesel fuel, pure NexBTL, NexBTL10, NexBTL 20, NexBTL 30, NexBTL40, NexBTL50, NexBTL70 and NexBTL85. The energy, pollution and in-cylinder parameters were analyzed under medium engine speed (n = 2000 and n = 2500 rpm) and brake torque load regimes (30–120 Nm). AVL BOOST software was used to analyze the heat release characteristics. The analysis of brake specific fuel consumption showed controversial results due to the lower density of NexBTL. The mass fuel consumption decreased by up to 4%, and the volumetric consumption increased by up to approximately 6%. At the same time, the brake thermal efficiency mainly increased by approximately 0.5–1.4%. CO, CO_2, NO_x, HC and SM were analyzed, and the change in CO was negligible when increasing NexBTL in the fuel blend. Higher SM reduction was achieved while increasing the percentage of NexBTL in the blends.



Featured Papers

DOI: 10.3390/en12173244

Exploitation of Mowed Grass from Green Areas by Means of Anaerobic Digestion: Effects of Grass Conservation Methods (Drying and Ensiling) on Biogas and Biomethane Yield

Authors: Alessandro Chiumenti, Andrea Pezzuolo, Davide Boscaro and Francesco da Borso

Abstract: Grass from landscape management or from agricultural practices is currently destined mainly for composting, with the production of a valuable product; however, this process demands energy. Anaerobic digestion, instead, represents an energy-positive process that results in the production of fuel, biogas, and a fertilizer, namely digestate. Previous tests for the evaluation of biogas yield from freshly harvested grass gave promising results. However, for a practical exploitation of this resource, appropriate conservation is necessary in order to enable the daily load of digesters while reducing the loss of organic matter. The present work is focused on the evaluation of biogas and methane yield from dried and ensiled grass (without conditioning) in order to assess eventual biogas potential losses in comparison to digested fresh grass. Tests were performed with grass collected from riverbanks (Veneto, Northern Italy) in batch, lab scale digesters. Dry and ensiled grass showed a good potential for exploitation in the anaerobic digestion process, reaching biogas yields of 565.9 and 573.4 NL·kgVS−1, respectively. Compared to the biogas yield of 639.7 NL·kgVS−1 of the fresh grass, the conservation treatment determined yield reductions of 11.5% and 10.4% for dried and ensiled grass, respectively. However, considering the methane yields, conservation treatments showed lower reductions, amounting to 4.8% for dry grass and 0.5% for ensiled grass; presumably the higher concentration of organic acids in ensiled grass determined a higher methane content in biogas and the consequently lower reduction of methane yield.

DOI: 10.3390/en12071359

Investigating the Influence of Reaction Conditions and the Properties of Ceria for the Valorisation of Glycerol

Authors: Paul J. Smith, Louise Smith, Nicholas F. Dummer, Mark Douthwaite, David J. Willock, Mark Howard, David W. Knight, Stuart H. Taylor and Graham J. Hutchings

Abstract: The reaction of aqueous glycerol over a series of ceria catalysts is investigated, to produce bio-renewable methanol. Product distributions were greatly influenced by the reaction temperature and catalyst contact time. Glycerol conversion of 21% was achieved for a 50 wt.% glycerol solution, over C_xO_y (8 m^2 g^{-1}) at 320 °C. The carbon mass balance was >99 % and the main product was hydroxyacetone. In contrast, at 440 °C the conversion and carbon mass balance were >99.9 % and 76 % respectively. Acetaldehyde and methanol were the major products at this higher temperature, as both can be formed from hydroxyacetone. The space-time yield (STY) of methanol at 320 °C and 440 °C was 15.2 and 145 g_{MeOH} kg_{cat}^{-1} h^{-1} respectively. Fresh C_xO_y was prepared and calcined at different temperatures, the textural properties were determined and their influence on the product distribution at iso-conversion and constant bed surface area was investigated. No obvious differences to the glycerol conversion or product selectivity were noted. Hence, we conclude that the surface area of the C_xO_y does not appear to influence the reaction selectivity to methanol and other products formed from the conversion of glycerol.