J Fundam Renewable Energy App 2016, 6:5(Suppl)
http://dx.doi.org/10.4172/2090-4541.C1.018

Work regimes and behaviour of mineral matter in biomass boiler systems

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This article gives an overview of the first results of a long-term research on work regimes and behaviour of mineral matter in biomass boiler systems. As woody biomass is gaining importance as an energy source for electricity and heat, we need to investigate, with scientific methodology, the main problems that occur with biomass boiler systems. There are more researches on large power plants and lab scale batch boilers, but the results are often not applicable in case of small and medium size biomass boilers on which the research has been limited. In this article, two small-scale combined heat and power (CHP) plant industrial boiler systems are compared based on design and measured operating data. One boiler system uses grate firing and the other one uses bubbling fluidised bed technology. Both CHP plants have capacities of 2 MW electrical and 8 MW thermal. Previous research on the subject is reviewed, the set-up of the experiment is described and the results are provided and analysed. First conclusions on a more suitable technology for a mixed woody biomass fuel are drawn.

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How to crack down the biomass recalcitrance for fuels and chemicals: A novel approach from nature-inspired technology

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In line with the requirements for sustainable economics and clean environments, biofuels from cellulosic biomass have recently received tremendous attention both in industry and academic communities worldwide. However, despite the surging popularity of biofuels as transportation alternatives; they, in current, have barely put a dent in our use of oil. It is clear that breakthrough technologies are still needed to overcome barriers, particularly for deeper understanding of biomass recalcitrance, developing cost-effective processes for converting biomass to fuels and chemicals. At present, it has become a world leading-edge research field to evaluate and mimic a variety of natural lignocellulosic systems, such as cellulose-eating animals, wood-feeding termites/insects, or other biomass utilization systems, to achieve efficient conversion and utilization of lignocellulosic biomass for fuels and chemicals. This review addresses various lignocellulolytic systems, their potential values, challenges, and opportunities that exist for scientists and industries to advance the biofuel technology, where the following topics will be further addressed: 1) Scientific and industrial potentials of the natural biomass utilization systems; 2) Novel biocatalysts explored from natural biomass utilization systems and their engineering potential for industrial uses; 3) Novel microbial symbionts discovered from natural biomass utilization systems by "omics" technologies; 4) Bioreactor innovations mimicked and advanced from the efficient biomass utilization systems by nature-inspired technology. With this overview, I hope that you can sense the excitement of the scientific endeavors both from China and the rest of world to crack the hard nut in developing lignocellulosic biofuels.

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