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Short Review Paper

Biowaste to Energy Status in an India

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Abstract

Biowaste as a pollutant is a major threat to the environment and available renewable resources such as air, water, soil and harm the natural scenery of our environment. This biowaste threat is increased day by day with alarming rate mainly in a developing country like India. The reported data of increment of waste was 62MT in 2006 to 436 MT by 2050. This problem of increment is controlled by recycling and transforming the waste into fuel production, electricity generation and transportation purposes. The aim of the study mainly focuses on the torrefaction technology is better for fuel production with respect to other traditional technology such as biomass gasification and pyrolysis.

Keywords: Biowaste, torrefaction, pyrolysis, biofuel.

Introduction

Although, unwanted waste material is conventionally accessed as a pollutant which spread steadily by human activities if not handle it properly is a major threat to the available renewable resources such as air, water, soil and natural scenery. The current problem of saving the threatened natural resources by recycling the waste material at an industrial byproducts generation such as compost and fertilizers or energy generation. The other purpose of waste material usage instead of energy production, utilized in a transportation, cooking and electricity especially in a rural region of India. These waste materials are solid or unwanted or useless matter, which can be used for various forms of fuel generation if managed properly.

According to the Indian government organization: Ministry of Environment and Forests (MoEF) survey, India is the world's third-largest garbage producing country. Worse, while just about 75% of municipal waste is collected, only 22% of this is processed and treated. This situation becomes alarming when one considers until 2030, waste generation is expected to more than double from the present 62MT (New Tech to convert waste energy may help India deal with garbage woes) as per 2006 reported data and probable to 7-times increment upto 436MT until 2050. Around 10.03% e-waste growth and 8.41% biomedical waste[1] growth increment occur in a waste management market.

Now MoEF, is planning with revised rules to address source separation, proper material retrieval, unwanted waste treatment promotes recycling industries with high chances of jobs, industries sustainability and enhance their living standard of rural peoples.

Technology wise improvement in India

With around 1000MT of agro-waste residues are available in India mainly coming from rural regions: the option of availability of waste residues in a vast amount creates easy thermal conversion of biowaste to biofuels and energy can indirectly reduce the dependency on oil and control the carbon emissions[2]. The technologies of biowaste combustion and cogeneration were commercially feasible technologies mainly for the power production especially in rural regions. Several decentralized energy generation projects based on the biomass combustion and cogeneration were running especially in energy-deficit rural areas. Around 17000MW power is extracted from cogeneration with 6000MW power of sugar industries[3]. Now days, biowaste gasification technology is utilized at present to combat the energy deficit condition but not yet practiced in India. However, more than 1600 having a capacity of 16MW small gasifier systems were made to generate 42millionkwh power for several organization and rural villages. Biofuels from biomass pyrolysis is utilized to generate transportation fuel and it is still evolving. Pyrolysis technologyis not yet found significant application in India, but still extensive research is ongoing to render it for commercially viable[4]. The strategy of biofuel production from biowaste opens a new and supportive way as it can solve the ecological problems such as pollution and energy demands across the world. Biofuels production is now becoming a priority in developing bio-based economy[5] and their usage lowers GHG emissions lesser than the fossil based fuels[6].

Through SAHYOG Project, showed the picture of recent developments in the sector of bio-based economy domain and it plan to research in the direction focusing on a roadmap of bio-

economy by exploiting agro residues/bio-waste as a feed mainly in India and EU countries for fuel generation Sahyog Project[7].
The aim of the study mainly focuses on the torrefaction technology is better for biofuel generation with respect to other traditional technology such as biomass gasification and pyrolysis.

Literature Review

Torrefaction of biowaste is an emerging technology as an efficient technically to improve its physicochemical properties, useful for co-firing purposes. Actually, Torrefaction technique is energy conserving method, where slow pyrolysis of biowaste is occurred. Earlier, Torrefaction technique is simply restricted to burn or combust, gasified or co-fired different types of wood[8]. Actually, it's a pre dissolution technique, biowaste is slowly heated or mild pyrolysis in the presence of inert atmospheric condition at 400–600K under anaerobic condition, suitable for a solid biofuel product generation[9-11]. The torrefaction technology is at initial stage of demonstration, but the results of experimental research studies show the property of grind ability of torrefied biomass can be comparable to coal in terms of combustion reactivity and comparable to wood[12]. However, torrefaction condensate contains several inhibitory compounds, such as furfural, 5-hydroxymethylfurfural and guaiacol, retard the activity of microbes[13].

In this study, for the first time, found that the detoxification of torrefaction condensate is necessary step by removing the major inhibitory furfural compound and recyled the detoxified torrefaction condensate for anaerobic digestion via digester, useful for the purpose of fuel, electricity generation especially in rural regions. At the end of the torrefaction process, a uniform solid product having lower moisture and higher energy content than raw biomass is produced. Most of the smoke-producing compounds and other volatiles are removed during torrefaction process, which produces a final product that will have a lower mass but a higher heating value.

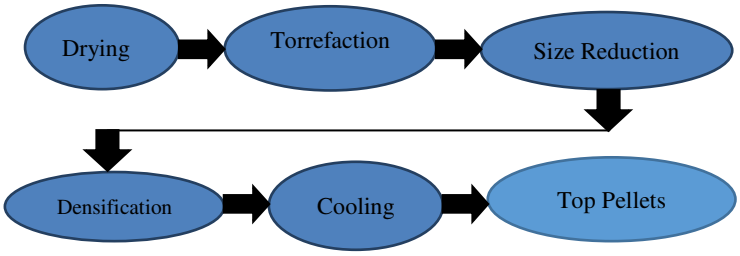

Figure-1: Flow diagram for production of torrefied wood pellets[14].

Torrefaction technology improves the biowaste dissolution and eliminate the inhibitory compounds such as furfural and the biowaste is further proceed for fuel production.

Conclusion

Researcher's are expressing huge interest in improving bio-waste properties including ignitibility, reactivity, calorific value by grind ability and pelletization etc. One of the most important technical aspects with biomass torrefaction is to improve the anaerobic digestion of biomass by microbial consortium which directly enhance the biofuel production by employing fermentation process. This strategy is actually an involvement of biological and physical processes. The processes like anaerobic digestion and fermentation and combinations of various technologies can be used to tackle the rising demand of energy in India. Utilizing the bio-wastes would not only provide supply of fuels on sustainable basis but would also be helpful in conserving our environment.

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