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Commentary

Investigating Sustainable Solutions: Recycling Agricultural Waste to generate Bio-Briquettes for Energy Production in India

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DESCRIPTION

In modern India, disposing of agricultural trash safely and effectively is a major challenge. Making highly compressed fuel briquettes out of these agricultural wastes is one potential way to dispose of them. This study describes an experimental investigation of the fuel properties of bio-briquettes made by mixing the palm flower with different bio-waste materials, such as ground nut shells, rice bran, tamarind shells, mango leaves, and teak wood leaves, and using paraffin wax as a binder. 50% palm flower, 40% other bio-waste, and 10% paraffin wax were combined to create briquettes. Paraffin wax served as the binding agent. Additionally, the proximate analysis was carried out to determine the biomass briquettes' calorific values as well as the presence of moisture, volatile matter, ash, and fixed carbon.

The findings indicated that, in comparison to other waste materials, the composite biomass briquettes demonstrated improved combustion qualities. Because of its reduced bulk density, biomass cannot be used as an effective flammable fuel in its current form, which increases transportation and storage costs.

Bioenergy derived from biomass is unquestionably a renewable energy source and a productive substitute for traditional energy sources. In contrast to coal, biomass has a higher moisture content, a higher volatile matter content, and a lower potential for energy in its natural state. Before such biomass may be utilized as fuel in addition to coal or as a coal substitute, considerable pretreatment work must be done to improve its combustion characteristics. Torrefaction, a thermochemical process, is a simple and effective way to change the properties of biomass so they are nearly identical to coal. The co-firing of coal and torrefied biomass for energy generation was initially studied by the Energy Centre of the Netherlands (ECN), which produced a comprehensive report on the subject in 2005.

Biomass is the collective term for any organic material, living or dead, generated from plants or animals. With the aid of solar energy, plants transform atmospheric carbon dioxide into carbohydrates, which is how biomass is produced. By devouring these plants or other biological species that are added to the biomass chain, biological species will increase. When exposed to sunlight, green plants use the process of photosynthesis to split water into electrons and protons, converting CO_2 into glucose while releasing O_2 as a waste product. Agricultural and forest residue, timber, energy crops, industrial and municipal wastes, and other materials can all be used to produce biomass. Virgin biomass typically consists of wood, plants, vegetables, leaves, and crops, whereas waste biomass is made up of sewage, animal waste, waste from human and agricultural areas, and municipal solid and liquid wastes. Municipal solid waste is primarily composed of waste biomass, which comes from renewable sources such as paper, grass, leaves, clippings, organics, and food waste from fruits, cereals, and other vegetables. Because it contains fat and food waste, sewage sludge is also considered an important source of biomass. Additionally, waste from sawmills that prepare wood for lumber is collected.

Generally speaking, biomass is divided into two parts: Extractable and non-extractable. Alkaloids, lipids, waxes, proteins, simple sugars, phenolics, gums, resins, glycosides, starches, sapomins, and essential oils make up the extractable fraction. Burning coal is the primary source of carbon dioxide emissions, which are expected to account for 41% (or 43,676 MMT of CO_2) of global emissions by 2030. Burning waste biomaterials from the pulp and paper industries as well as forest wastes might provide steam, heat, and power. Because biomass is abundantly available as agricultural waste, emits no CO_2, has a low sulfur content, and is neutral in emissions, it is a significant source of energy. Compared to coal, biomass energy has a lower heating value, which results in a lower energy density. Although biomass energy is considered carbon neutral, after combustion a certain amount of carbon is released. The plants then reabsorbed this released carbon, which led to their stagnant development, in order to maintain the economic equilibrium. Because there is less nitrogen and sulfur in biomass energy, such biomass burns with low NO_2 and SO_2 emissions, respectively.

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