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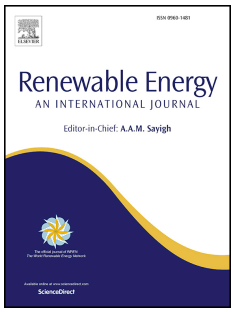

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EVALUATION OF ENERGY GAIN FROM THE SEGREGATION OF ORGANIC MATERIALS FROM MUNICIPAL SOLID WASTE IN GASIFICATION PROCESSES.

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Abstract: The energy recovered from increasing amounts of municipal solid waste (MSW) is very advantageous as a source of sustainable energy. An option to convert MSW to useful products is the production of syngas for electric power generation. This strategy is viable with new and emerging technologies based on gasification. The purpose of this article is to evaluate the energy potential of MSW from its segregation. Through the obtained results, it was verified the expressive energy gain with segregation and consequent drying of MSW. It was estimated a production of 368 kW to 770 kW, per tonne of processed MSW, in the studied gasification system. Therefore, the pre-treatment of waste through segregation may be a practical mean of achieving a sustainable route of electric power generation from MSW through gasification and combustion, as long as the process of segregation is executed through simple steps and with low cost. With the segregation of organic materials, in addition to doubling the amount of energy produced by the gasifier, it is also possible to make organic matter available for biodigestion and/or processes for production of gases with high aggregate value.

Keywords: energy; syngas; municipal solid waste; gasification; segregation.

INTRODUCTION

Highly industrialized countries tend to employ thermal methods (such as gasification) for municipal waste treatment, because such countries do not have enough land for new landfills, and their previously constructed landfills are almost full [1]. Besides, the waste-to-energy technologies reduce the mass and volume of residues, destroy hazardous compounds and the produced thermal energy can be used for other purposes [2].

The gasification process is composed of exothermic polymer cracking reactions through partial oxidation of organic matter at high temperatures (550 – 1400 ºC) and variable pressures (from approximately 1 to 33 bar). Usually carbon monoxide (CO), hydrogen (H_2), carbon dioxide (CO_2), tar, ash and other volatile compounds are obtained from the gasification of organic materials. It is important to explain that the gasification process is preceded by the steps of drying (endothermic vaporization at low temperatures (from 25 to 110 ℃) of compounds with low boiling points, such as water) and pyrolysis (endothermic decomposition of low density polymers, and volatilization of other compounds with low molecular weight, at temperatures ranging from 110 to 550 ℃). For the occurrence of the three steps, the gasifier must be built with subdivisions that have thermal exchange areas (whether by convection or radiation) for drying and pyrolysis reactions. For the gasification itself, the pre-heated compounds are oxidized in a sub stoichiometric environment with atmospheric air [3–7].