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Refuse Derived Fuel from Municipal Solid Waste rejected fractions- a Case Study

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Abstract

Portuguese legislation enforces adequate alternatives to municipal waste landfilling of organic wastes as well as others susceptible of valorisation. In the present work, the energetic valorisation of final municipal solid wastes rejected fractions is studied through the production of Refuse Derived Fuel (RDF). To accomplish this purpose several sampling campaigns were performed. Physical, chemical and energetic characterization of the rejected streams was done. Preliminary data allows us to conclude that studied materials have interesting potential to be used as RDF, particularly if blended with higher heating value materials in order to obtain RDF pellets with good combustion behavior, consistency and storage characteristics.

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Keywords: MSW rejected fractions; RDF

1. Introduction

European legal framework emphasizes measures for waste valorisation and the utilization of endogenous resources in order to minimize the amount of wastes send to landfill, namely enhancing the valorisation of the rejected streams from the multi-municipal waste management systems with RDF production [1]. In Portugal, as in

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other countries, it is expected the application of RDF in direct combustion or co-combustion systems, namely in the cement manufacturing, paper and pulp mills or in thermoelectric power plants, keeping in mind the principle of proximity manufactures-users. The legal framework is governed by the Integrated Pollution Prevention and Control Directive (2010/75/UE, 2010) [2]. The recovery of energy from these fuels is also possible through the syngas production by gasification, but even in this process, ways to reduce moisture and increase the heating value should be followed [3, 4, 5, 6].

The region under investigation, located in Central Portugal, has an integrated municipal waste management system serving 19 municipalities and 350 000 inhabitants, where municipal and industrial non-hazardous solid wastes are mainly landfilled. A scheme of the operations done in the waste management system under study is shown in Figure 1. Unit operations are mechanical and biological treatment and selective materials collection. These processes lead themselves to final rejected wastes, traditionally send to landfill, considered the rejected fraction in Figure 1.

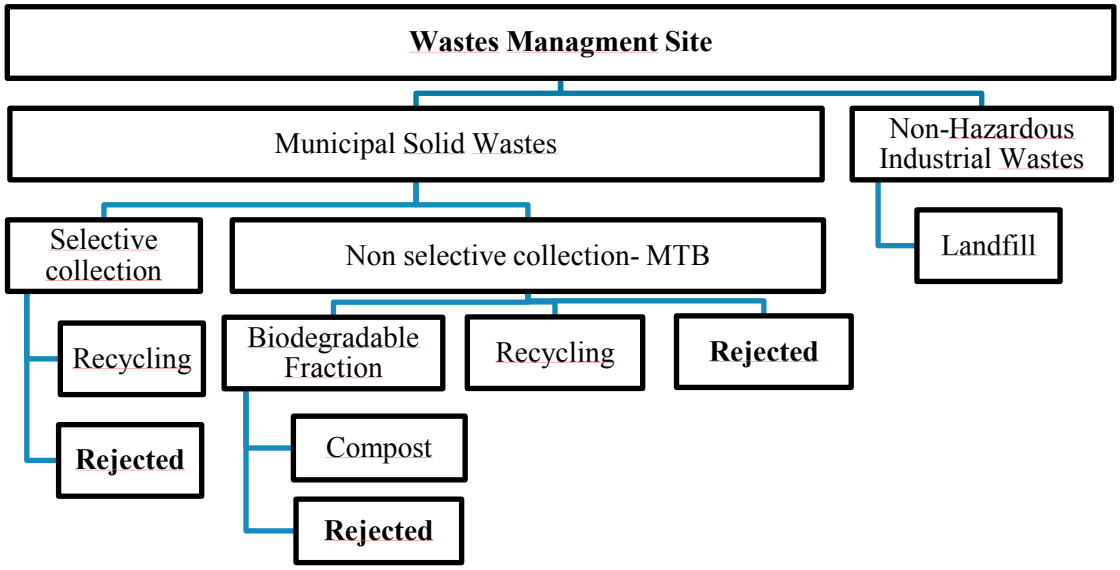

Fig. 1. Materials flow from the management operations within the Wastes Management plant.

Municipal Solid Wastes (MSW) that contain mixtures of paper, wood, green wastes, food wastes, plastics, leather, and rubber can have energy characteristics similar to wood. Use of MSW as a fuel can be accomplished by burning the as-received material, called mass burning, but processing is often required before it can be burned effectively. The purpose is to reduce size and remove materials, valuable materials or non-combustible materials in order to be reclaimed and used as alternative fuel for sustainable disposal and converted into green and clean energy. The impact of burning these heterogeneous materials in traditional boiling systems, as primary or supplemental fuel, needs to be assessed: the physical and chemical characterization of raw materials should be performed. According to Portuguese Standard NP 4486:2008, based in the technical specifications CEN/TC 343 “Solid Recovered Fuels” a classification system is used based on RDF main parameters: lower heating value, chlorine and mercury content.

The ideal composition of RDF is high content in plastics, paper/cardboard, polymeric containers textiles, wood and other organic matter [7, 8]. Higher heating value is in fact associated with paper/card, plastics, wood and textiles content and, once these materials have in their composition biogenic compounds (40-80% w/w), they become an interesting alternative fuel to accomplish the reduction of CO_2 emissions. Moreover, meaningful advantages of RDF are its low production costs and significant calorific value [9]. The drawback associated to these fuels is their heterogeneity, moisture and high ash, chlorine or sulphur content associated with energetic density,