Combustion of olive residues in a fluidized bed : Optimization of biomass moisture and operating conditions

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ICDERS, Leeds, from 03-08-2015 to 07-08-2015.

In typically Mediterranean countries, olive oil industry is an important economic sector that generates alot of waste. One of these biomass waste is the olive pomace resulting from the transformation process of the olive oil. This residue can be used as solid fuel, to produce heat and electricity. Various studies have shown the possibility to burn different biomass residues in fixed bed, or circulating fluidized bed combustion systems [1-5] or in grate type-incinerator [6]. A limited number of studies on fluidized bed combustion of olive residues are conducted. This study falls within the framework of a project called VERA, funded by the "Region Centre (France)". In the present work combustion studies of olive pomace were conducted in an atmospheric fluidized bed with moderate excess air environment. The reactor is a vertical cylinder 0.35 m inner diameter and 1,5 m in height made of stainless steel. In the bottom of the reactor there is a circular cup with a perforated bottom as a grate. The olive residues are delivered continuously to the reactor from mechanical feeding system. The products of combustion are delivered to a cyclone attached to the exhaust pipe in which the entrained particles are collected. Olive residues have a high moisture, between 35 and 70%, depending on the transformation process of the olive oil. The first phase is to reduce moisture by drying using solar thermal energy [7], and the second phase is to burn the dried residues. The results concerns the effects of excess air, olive pomace particle size and the moisture on the behavior of temperature and of major gaseous pollutants in different regions of combustion chamber, and in exhaust combustion gas. Chromel-alumel (K type) thermocouples were used to measure the temperature. The concentration of gaseous in flue gas were measured by on line analyzer. The chemical structure of olive residues is also determined, and, the thermogravimetric analysis is conducted to determine the ultimate and proximate analysis and lower heating value.

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