World Academy of Science, Engineering and Technology
International Journal of Agricultural and Biosystems Engineering
Vol:8, No:06, 2014

Engineering Study on the Handling of Date Palm Fronds to Reduce Waste and Used as Energy Environmentally Friendly Fuel

Authors : Ayman H. Amer Eissa, Abdul Rahman O. Alghannam

Abstract : The agricultural crop residuals are considered one of the most important problems faced by the environmental life and farmers in the world. A study was carried out to evaluate the physical characteristics of chopped date palm stalks (fronds and leaflets). These properties are necessary to apply normal design procedures such as pneumatic conveying, fluidization, drying, and combustion. The mechanical treatment by cutting, crushing or chopping and briquetting processes are the primary step and the suitable solution for solving this problem and recycling these residuals to be transformed into useful products. So the aim of the present work to get a high quality for agriculture residues such as date palm stalks (fronds), date palm leaflets briquettes. The results obtained from measuring the mechanical properties (average shear and compressive strength) for date palm stalks at different moisture content (12.63, 33.21 and 60.54%) was (6.4, 4.7 and 3.21MPa) and (3.8, 3.18 and 2.86MPa) respectively. The modulus of elasticity and toughness were evaluated as a function of moisture content. As the moisture content of the stalk regions increased the modulus of elasticity and toughness decreased indicating a reduction in the brittleness of the stalk regions. Chopped date palm stalks (palm fronds), date palm leaflets having moisture content of 8, 10 and 12% and 8, 10 and 12.8% w.b. were dandified into briquettes without binder and with binder (urea-formaldehyde) using a screw press machine. Quality properties for briquettes were durability, compression ratio hardness, bulk density, compression ratio, resiliency, water resistance and gases emission. The optimum quality properties found for briquettes at 8 % moisture content and without binder. Where the highest compression stress and durability were 8.95, 10.39 MPa and 97.06 %, 93.64 % for date palm stalks (palm fronds), date palm leaflets briquettes, respectively. The CO and CO2 emissions for date palm stalks (fronds), date palm leaflets briquettes were less than these for loose residuals.

Keywords : residues, date palm stalks, chopper, briquetting, quality properties
Conference Title : ICAFE 2014 : International Conference on Agricultural and Food Engineering
Conference Location : New York, United States
Conference Dates : June 05-06, 2014