

DATE STONES AS A RENEWABLE ENERGY SOURCE

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The combustion of date stones in a small-scale furnace with a conical solid fuel bed is investigated experimentally. This investigation (to the best of the knowledge of the author) is the first addressing the "Date Stones" as a new renewable energy source. A photograph of date stones is shown in Fig. 1.



Fig. 1: The used biomass fuel; Date Stones.

Traditionally dates are of a great importance both for individuals and agricultural experts. Dates are also used as a raw material in many food industries. Also dates are used as a constituent in some animal feeds. In this work experiments on the combustion of date stones in a backed bed are conducted. Backed bed combustion of biomass fuels is still considered to be the basic method to convert these fuels into thermal energy. The processes taking place in the bed are complicated and interrelated. These include the heat-up and drying of fuel particles, the devolatilization, gasification and pyrolysis, the combustion of the volatiles and the liquids coming out from the pyrolysis process in the gaseous phase, and the heterogeneous reactions between the solid fuel and the oxidizer.

Different experimental conditions are investigated in this study, where different fuel-feed conditions and different combustion air flow rates are considered. Major results are given in terms of the fuel reduction rate and the rate of heat transfer to the cooling water flowing in a water jacket around the furnace, as functions of time. The combustion of date stones is initiated by using LPG fuel as a starter. Hereby hot products of LPG-combustion taking place in a burner placed prior to the investigated furnace are allowed to penetrate for about two minutes the fuel bed from its bottom base in the upward direction, causing effective heat-up and gasification and pyrolysis of the solid fuel in the

bed. The resulting combustible gases mix with the combustion air and subsequently are ignited by an external ignition source. After this initial starting period the LPG combustion is stopped.

The overall assessment of the results obtained indicate that date stones could be considered as a promising renewable source of energy.