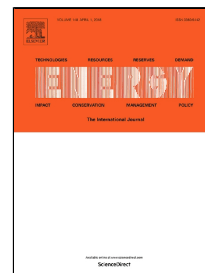


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Thermal performance evaluation of production technologies for non-centrifuged sugar for improvement in energy utilization

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19
20 **Abstract**

21
22 Non-centrifuged sugar (NCS) is produced through the evaporation of water from sugarcane juice,
23 using the thermal energy released from the combustion of sugarcane bagasse. The energy efficiency
24 of the process varies significantly according to the technology implemented in evaporation and
25 combustion operations. Therefore, energy optimization usage becomes essential for the
26 improvement of the equipment, as well as the appropriate development of the manufacturing
27 process. The aim of this study was to evaluate seven groups of technologies related to bagasse
28 combustion and heat exchange systems, used in the production of NCS. The evaluation was
29 performed based on five parameters: overall thermal efficiency (η), energy consumption (MJ)/NCS
30 (kg), O₂, CO₂ and CO emission indices at the exit of the process, flue gases/NCS (kg/kg), and air-
31 fuel ratio (AFR). Each group of technologies evaluated had a significant effect on the parameters
32 considered. However, the best results were shown by the technologies where steam was used in
33 closed systems, obtaining an overall thermal efficiency of 63.63 ± 5.17 %, with a significant
34 decrease in fuel consumption and lower gas emissions.

35
36 **Keywords**

37
38 Thermal efficiency; combustion systems; evaporation systems; environmental indices.

39
Nomenclature

Latin characters

A Flat bottom pan with fins

AFR Air-fuel ratio

B Boiler

SC Sugar cane

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