

## A Comprehensive CFD Model for Sugar-Cane Bagasse Heterogeneous Combustion in a Grate Boiler System

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**Abstract :** The comprehensive CFD models have been used to represent and study the heterogeneous combustion of biomass. In the present work, the operation of a global flue gas circuit in the sugar-cane bagasse combustion, from wind boxes below primary air grate supply, passing by bagasse insertion in swirl burners and boiler furnace, to boiler bank outlet is simulated. It uses five different meshes representing each part of this system located in sequence: wind boxes and grate, boiler furnace, swirl burners, super heaters and boiler bank. The model considers turbulence using standard  $k-\varepsilon$ , combustion using EDM, radiation heat transfer using DTM with 16 ray directions and bagasse particle tracking represented by Schiller-Naumann model. The results showed good agreement with expected behavior found in literature and equipment design. The more detailed results view in separated parts of flue gas system allows to observe some flow behaviors that cannot be represented by usual simplifications like bagasse supply under homogeneous axial and rotational vectors and others that can be represented using new considerations like the representation of 26 thousand grate orifices by 144 rectangular inlets.

**Keywords :** comprehensive CFD model, sugar-cane bagasse combustion, sugar-cane bagasse grate boiler, axial

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