CFD modelling of coal and olive pomace combustion in a cement rotary kiln – investigation of fuel composition impacts

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ABSTRACT

In this paper, a comprehensive computational fluid dynamics (CFD) methodology was adopted to investigate the effect of Olive Pomace (OP) composition on the combustion characteristics. Simulations are performed using COMSOL software and are conducted for a simplified rotary cement kiln burner. Modeling of (OP) combustion for a cement rotary kiln was mostly carried out in the burning zone close to the burner and did not account for the effects of the clinker formation process, which influences the temperature of gas phase.

This work assumes that the flow regime is steady-state and the fluid is incompressible. The kiln rotation as been neglected as it has been done in the previous studies [1]. The flow in a rotary kiln is a typical kind of gas-solid turbulent flow with chemical reactions. The models for the rotary kiln consist of RNG k-ε turbulent model for gas phase and the Euler-Euler model for solid-phase coupled with volatile combustion and char heterogeneous combustion. Radiation model were employed in the simulation [2, 3] for gas-phase radiation.

The developed approach, computational models and simulation results will not only help in developing better understanding of alternative fuel combustion but also provide quantitative information about influence of (OP) composition on combustion kiln performance.

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