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Establishing Combustion Behaviour for Refuse Derived Fuel Firing at Kiln Inlet through Computational Fluid Dynamics at a Cement Plant in India

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Abstract : Waste management is one of the pressing issues of India. Several initiatives by the Indian Government, including the recent one “Swachhata hi Seva” campaign launched by Prime Minister on 15th August 2018, can be one of the game changers to waste disposal. Under this initiative, the government, cement industry and other stakeholders are working hand in hand to dispose of single-use plastics in cement plants in rotary kilns. This is an exemplary effort and a move that establishes the Indian Cement industry as one of the key players in a circular economy. One of the cement plants in Southern India has been mandated by the state government to co-process shredded plastic and refuse-derived fuel (RDF) available in nearby regions as an alternative fuel in their cement plant. The plant has set a target of 25 % thermal substitution rate (TSR) by RDF in the next five years. Most of the cement plants in India and abroad have achieved high TSR through pre calciner firing. But the cement plant doesn’t have the precalciner and has to achieve this daunting task of 25 % TSR by firing through the main kiln burner. Since RDF is a heterogeneous waste with the change in fuel quality, it is difficult to achieve this task; hence plant has to resort to firing some portion of RDF/plastics at kiln inlet. But kiln inlet has reducing conditions as observed during measurements) under baseline condition. The combustion behavior of RDF of different sizes at different firing locations in riser was studied with the help of a computational fluid dynamics tool. It has been concluded that RDF above 50 mm size results in incomplete combustion leading to CO formation. Moreover, best firing location appears to be in the bottom portion of the kiln riser.

Keywords : kiln inlet, plastics, refuse derived fuel, thermal substitution rate
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