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# 3D Modelling of Fluid Flow in Tunnel Kilns

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**Abstract :** The present work investigates the behavior of fluid flow inside tunnel kilns using 3D-CFD (Computational Fluid Dynamics) simulations. The CFD simulations are carried out with the FLUENT software and validated against experimental results on fluid flow and heat transfer in tunnel kilns. A grid dependency study is conducted in the current work to improve the accuracy of the results. Three turbulence models k–ω, standard k–ε, and RNG k–ε are tested where k–ω model gives the best results in comparison with the experiment. The numerical results reveal an intriguing phenomenon where a long flow separation zone behind the setting is observed under different geometric and operation conditions. It was found that the uniformity of flow distribution can be substantially improved by rearranging the geometrical parameters of brick setting relative to kiln/setting. This improvement of flow distribution plays a critical role to enhance the quality and quantity of the production. It can be concluded that a better design and operation of tunnel kilns in terms of productivity and energy consumption can be obtained by taking into consideration the flow uniformity inside the tunnel kilns using CFD modelling.

**Keywords :** tunnel kilns, flow separation, flow uniformity, computational fluid dynamics
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