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# THE ANALYSIS OF A NOVEL DOUGH MIXER BASED ON CHAOS THEORY

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**Abstract**. *Mixing of wheat flour dough as a highly viscous food material that requires optimal mixing of particular, is of particular interest to food processing. The effectiveness of a dough mixer can be evaluated by looking at the ability of the mixer to distribute ingredients and stretch the dough molecules, as well as disperse air bubbles and cohesive clumps. In order to enhance mixing efficiency and heat transfer during dough mixing, a novel dough mixer is proposed here. The enhancement of mixing and heat transfer in novel dough mixer based on chaos theory by 3D numerical simulation is analyzed. The chaotic advection involves a combination of repeated stretching and folding of fluid elements in combination with diffusion.*

*In order to show the chaotic behavior of fluid trajectories numerically three characteristics of a Lagrangian chaotic system (strong stretching and folding of material lines and surfaces, sensitivity to initial conditions, horse shoe maps) are visualized. Lyapunov exponents which quantify the exponential divergence of initially close state-space trajectories and estimate the amount of chaos in a system were calculated. Velocity profiles, particles trajectories were also calculated. The results indicate that the flow filed is a combination of coexistence of both the chaotic and non-chaotic zones, with high and poor mixing performance respectively.*

**Keywords:** Dough, Chaotic advection, Mixing Performance, Stretching, Lyapunov Exponent