

Improvement on the distribution uniformity of hydrodynamics in a stirred tank with a novel H-like fractal impeller

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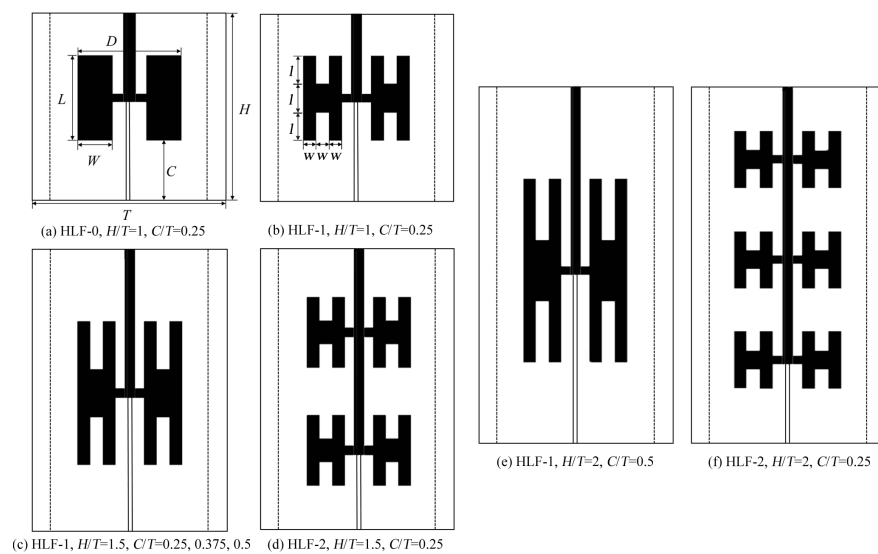
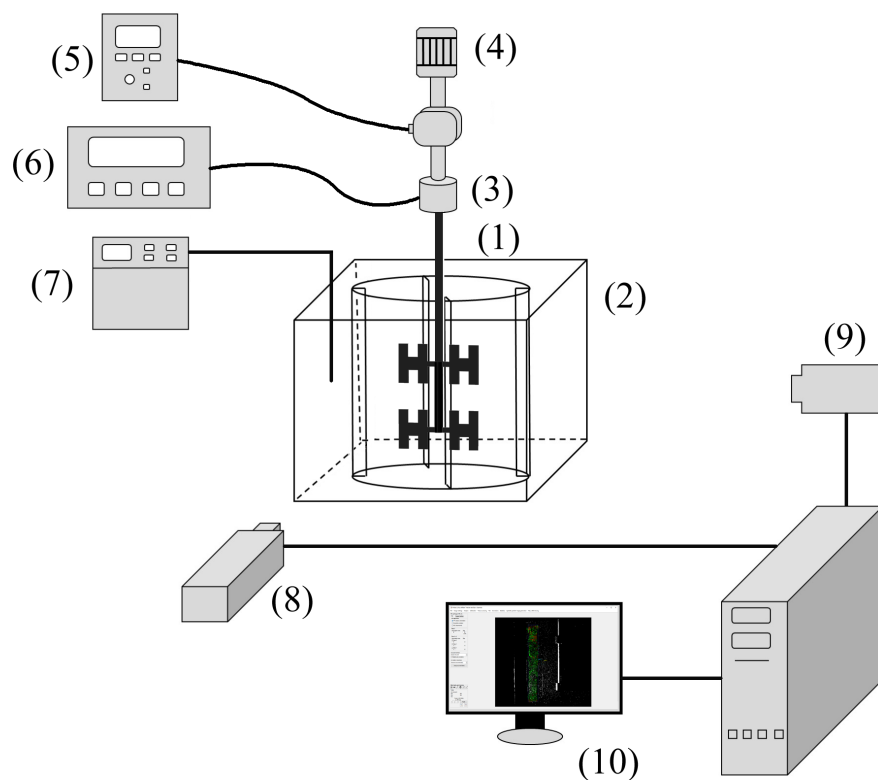
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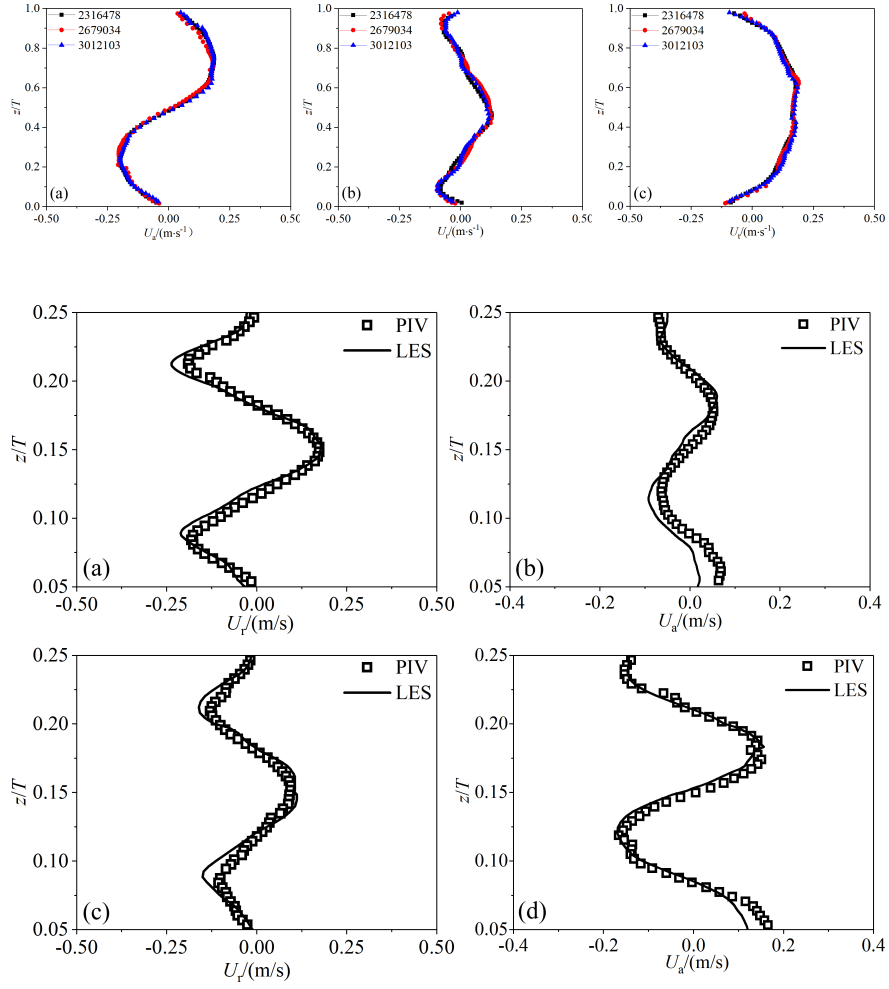
Abstract

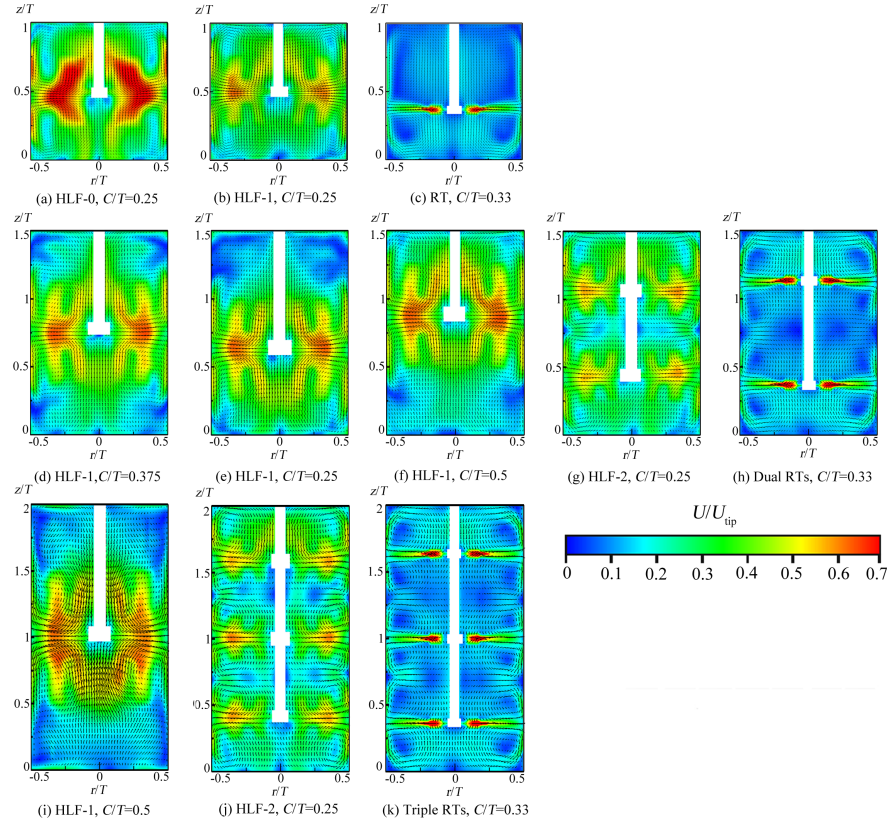
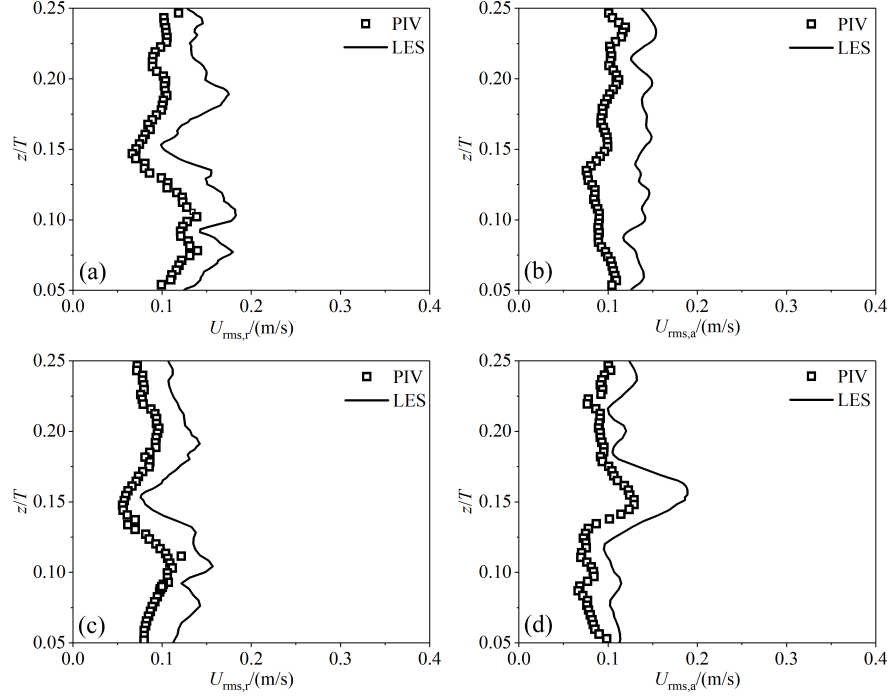
Fractal theory provides a new strategy for the equipment design and industrial amplification. In this work we propose a novel H-like fractal (HLF) impeller to improve the distribution uniformity of hydrodynamics in stirred tanks. The impeller with two vertical blades becomes fractal impellers by designing each vertical blade as an H-shaped sub-blade (HLF-1) or uniform arrangement of H-shaped sub-blades (HLF-2). Flow characteristics including velocity and turbulent kinetic energy (TKE) distributions, vortices, power number, are predicted by large eddy simulation. Compared with Rushton turbine (RT) impeller when $H/T=1$ (or dual RTs when $H/T=1.5$, triple RTs when $H/T=2$), the HLF impeller can produce a flow field with more uniform distributions of larger velocities and TKE level. The HLF-2 impeller can further improve distribution uniformity of hydrodynamics in the case of high H/T . Power analysis shows that this is mainly due to the improved energy utilization efficiency by the fractal structure design.

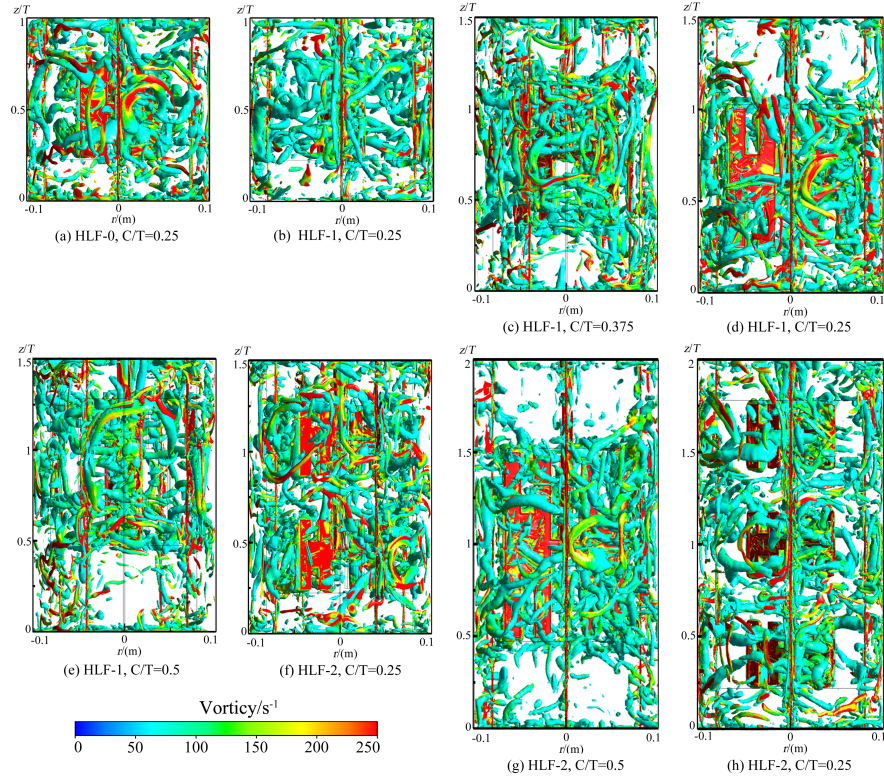
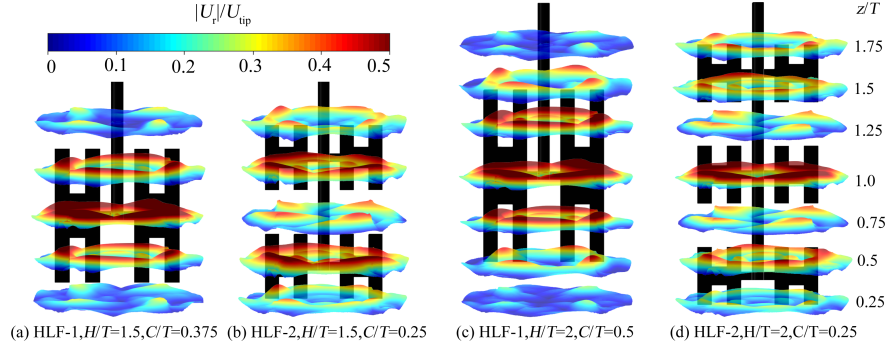
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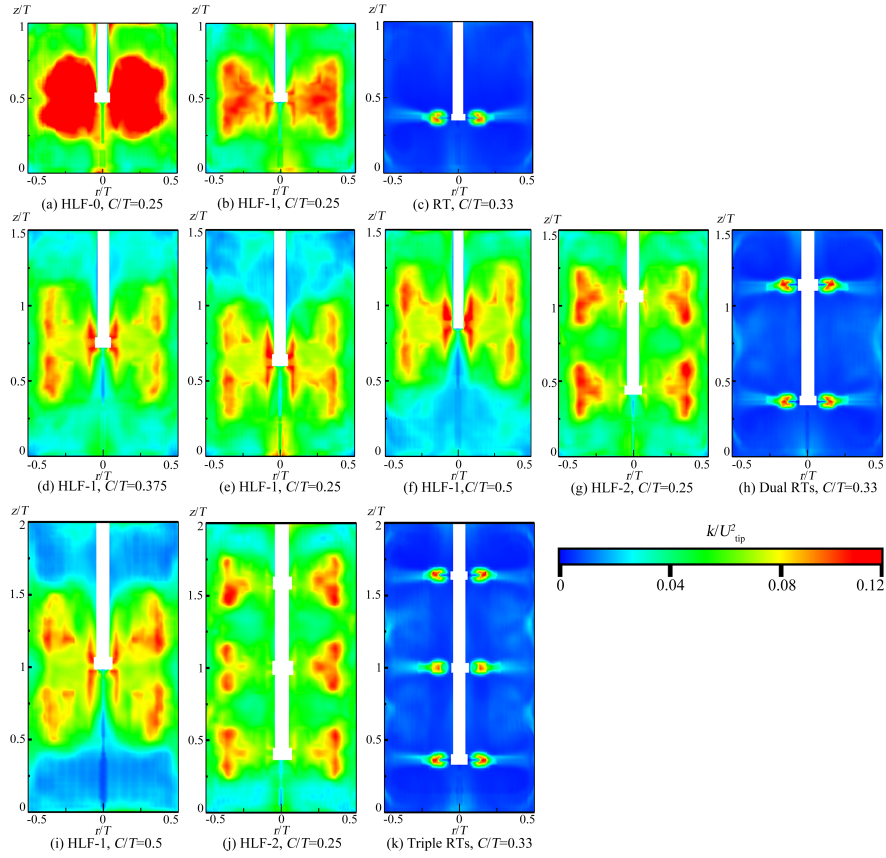
2022-YouP-H-like fractal impeller--2022.4.12.docx available at <https://authorea.com/users/437255/articles/565279-improvement-on-the-distribution-uniformity-of-hydrodynamics-in-a-stirred-tank-with-a-novel-h-like-fractal-impeller>











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