

Kenneth Chung

Kenneth H.K. Chung

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Kenneth graduated from The University of Birmingham in 2004 with a Master of Engineering degree in Chemical Engineering with Management. He had also worked at the BP refinery at Grangemouth as a summer intern in 2003.

There he designed and implemented a plant modification to solve recurring overpressure issues in a reactor that existed for 18 years! He also contributed to the 2004 polymer plant turnaround.

Kenneth's PhD project concerns with the hydrodynamics in stirred vessels employed in High Throughput Experimentations, a novel industrial technique that is gaining popularity in the catalyst, pharmaceutical and fine chemical industries. The small scale of these reactors (volumes in the order of 15-250 ml) enables the rapid screening of hundreds of samples simultaneously. In addition to their miniature size, these vessels are of unconventional geometry; arrangements such as off-centre positioning of the agitator, low impeller clearances and lack of baffles are common which preclude their characterisation via conventional scaling rules.

The aim of this project is to study and enhance the mixing efficiencies in these tiny vessels with the use of visualisation tool such as Particle Image Velocimetry (PIV) and Planar Laser Induced Fluorescence (PLIF). Three mixing conditions were studied: single phase mixing in the transition to turbulent regime, mixing of viscous Newtonian fluid in the laminar regime and gas/liquid two phase mixing.

The small size of these vessels however, precludes the use of conventional 3-D PIV, hence a method is developed which reconstructed the 3-D flow field from many different 2-D measurements. For an accurate measurement of the gas phase flow, an image analysis algorithm was written on the Matlab platform to automatically trace and extract gas bubbles in the two-phase gas liquid, prior to the FFT cross-correlation. Studies were also carried out in the following areas: time averaged and angle-resolve measurements, enhancement of existing PLIF technique and hydrodynamics in a novel cuboid HTE reactor.

Major Awards and Personal Achievements

- TI Group Bursary (2005)
- British Petroleum Bursary (2002)
- 3rd overall in Waterside Series canoe marathon (2000)
- 125 miles international canoe marathon (Devizes to Westminster) medallist (1999)

Affiliations

- Institute of Chemical Engineers
- Society of Chemistry and Industries
- British Mensa

Selected Publications

1. Chung, K.H.K., Simmons, M.J.H., Barigou, M., in press, Use of PLIF and PIV to characterise the laminar mixing of viscous fluids in a model High Throughput Experimentation stirred reactor, Proceeding of the Sixth International Symposium on Mixing in Industrial Process Industries
2. Chung, K.H.K., Simmons, M.J.H., Barigou, M., in proof, Local gas and liquid phase velocity measurement in a miniature stirred vessel using PIV combined with a new image processing algorithm, Experiments in Fluids
3. Chung, K.H.K., Simmons, M.J.H., Barigou, M., 2007, PIV measurement of phase velocities in a miniature high throughput Gas/Liquid stirred vessel reactor, Proceeding of the 6th International Conference of Multiphase Flow
4. Chung, K.H.K., Barigou, M., Simmons, M.J.H., 2007, Reconstruction of 3-D flow field inside miniature stirred vessels using a 2-D PIV technique, Chemical Engineering Research and Design. ISSN:0263-8762.
5. Chung, K.H.K., Barigou, M., Simmons, M.J.H., 2006, Reconstruction of 3-D flow field inside miniature stirred vessels using a 2-D PIV technique, Proceedings of the 12th European Mixing Conference on Mixing.
6. Ingram, A., Chung, K.H.K., Liu, K.M., Wood, J., Seville, J.P.K., 2005, Particle tracking to investigate flow behavior in a novel rotary gas/solid contactor, Proceeding of 7th World Congress of Chemical Engineering, C7-008.