

Optimisation Nozzle Design for Mixing Fluid using Computational Fluid Dynamics

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Abstract

The mixing of different chemicals has traditionally been achieved using a rotating paddle in a tank. An alternate option to mix chemicals together is using jet nozzles to spray them into the tank. This paper presents different setups that could be potentially used for selected tank and find the optimal design. The aspects that are changed in the report where the inlet pipe location, the outlet pipe location and the inlet fluid speed. By using SolidWorks to create the models and Star CCM+ to run the simulations, the results of each test where generated and analysed. The validation had been conducted prior to the simulation. When analysing the results, the primary area of interest was the location and size of any dead zones that occurred in the tank during the running of the simulation. The results show that the optimal design for this tank is a side entry inlet pipe at the top of the tank with a side exit outlet pipe at the bottom of the tank, perpendicular to the inlet pipe. It was also shown that a slower inlet speed improved the quality of the mixing process.

Keywords

Mixing fluid, Jet Nozzle, CFD, SolidWorks, Star CCM+

Biographies

Thomas Chenery was a student at University of Derby studying BEng (Hons) Mechanical Engineering. His interest is on the Computational Fluid Dynamics, SolidWorks and Design optimisation.

Dr. Dani Harmanto is currently the acting programme leader (course director) of BEng (Hons) Motorsport Engineering and senior lecturer in automotive Engineering at University of Derby. He had secured number of funding from UK and Local government for knowledge transfer partnership for developing a novel product. He obtained his mechanical engineering degree from ITN Malang, Indonesia. His MSc and PhD in Automotive Engineering from Coventry University, United Kingdom. He is also a Chartered Engineer (CEng). He is sitting in the committee of Education and Training at Institution of Engineering Designer (IED), United Kingdom as a member. He is also a member of the Automobile division at the Institution of Mechanical Engineering (IMEchE), United Kingdom. In addition to this, he is a Fellow Member of Higher Education (FHEA) in the UK. He is mainly teaching at undergraduate and master level (Thermofluids, CFD, FEA and Design). His main research interests include computational fluid dynamics, finite element analysis, and renewable energy. His current research concerns the reduction of the jet noise using Computational Fluid Dynamics with one of the world announce jet engine manufacturer. He is a member of reviewers for Proceeding of Institution Mechanical Engineering part A – Z and several other journal publications.