

Victoria Hawkins

Spinning Jets

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MSci (Hons) Applied Mathematics

Vicki is a PhD student in the Chemical Engineering Department and started her research in Fluid Mechanics at the University of Birmingham in 2006.

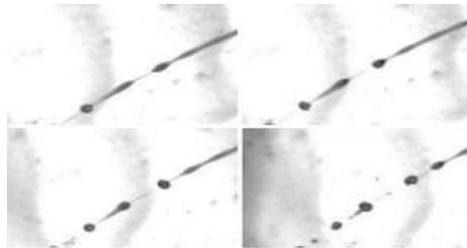
She is now working on looking at the break-up and drop formation of spiralling liquid jets. Some objectives of her project are:

- To compare the differences between the break-up of shear thinning non-Newtonian liquid jets with previous work performed on Newtonian liquid jets.
- Identifying features of break-up and exploring which parameter ranges these can be found in. This will hopefully lead to being able to predict the likelihood of observing certain features.
- To use the results of the experimental work to test existing theory.
- Investigating the effect of surfactants in viscous liquids on break-up and drop formation in liquid jets.
- To attempt to control the break-up of liquid jets by inducing a disturbance at the orifice by means of a vibrating nozzle.

The industrially important process of prilling allows for the production of small spherical droplets from molten material. In the prilling process molten liquid is pumped into a specially perforated vertical cylindrical drum which is suspended at the top of a tower and then rotates about its vertical axis. Due to centrifugal forces the melt is flung outwards towards the wall of the drum and thousands of long curved jets are produced from the perforations in the side of the drum. These jets break up due to a growth of surface tension driven instabilities on the surface of the jet. The droplets produced by break up fall against a counter current of cool air and solidify to form pellets.

The break-up of a liquid jet produces a non uniform distribution of drop sizes due to the non-linearity in the wave growth on the surface of the jet. This produces an asymmetric profile close to break-up which leads to the production of smaller satellite droplets in between the larger main droplets.

Within industry there is a need to optimise the prilling process in order to produce uniformly sized pellets and hence suppress the formation of the smaller satellite droplets.



Publications - Conference papers and presentations

Hawkins, V.L., Simmons, M.J.H., Uddin, J., Decent, S.P. (2007) The Break-up of spiralling non-Newtonian liquid jets, 6th International Conference on Multiphase flow, ICMF 2007, Leipzig, Germany, July 9-13 2007 (oral presentation and paper on Proceedings CDROM)

Hawkins, V.L., Simmons, M.J.H., Uddin, J., Decent, S.P. (2008) Break-up of spiralling non-Newtonian liquid jets. 50TH BAMC: British Applied Mathematics Colloquium, Manchester, 31st March - 3rd April 2008. (oral presentation).