**Simulation of self-compacting concrete in V-funnel test by SPH**

**Alyhya, W.\*, Karihaloo, B.L. and Kulasegaram, S.**

**School of Engineering, Cardiff University**

[\*Alyhyaws@Cardiff.ac.uk](mailto:*Alyhyaws@Cardiff.ac.uk)

**Abstract**

Computational modelling of flow for a fluid material such as self-compacting concrete (SCC) could be a potential tool for understanding its rheological behaviour and for mix proportioning as well. The present paper reports a recent numerical investigation of the rheological behaviour of fresh SCC in V-funnel test using 3D mesh-less smooth particle hydrodynamics (SPH) computational technique. It may be the most appropriate and practical technique in spite of there are [lots of](http://lifehacker.com/5055641/persuade-people-with-subconscious-techniques) simulation [techniques](http://lifehacker.com/5953183/three-of-the-most-evil-ways-to-manipulate-people-into-doing-what-you-want) as it provides advantages: the fully Lagrangian SPH approach has significant capabilities in modelling the flow of fluids with free surface flow. This approach could deal with a two-phase suspension flow of a wide range of sizes for particles suspended in a viscous paste matrix.

A great number of researchers considers SCC in most cases to behave like a Bingham model. Such model is characterized by two parameters: the yield stress and the plastic viscosity. The yield stress is the stress needed for the concrete to initiate flow, while the plastic viscosity is a characterization of the flow of the concrete once the stress is higher than the yield stress. The plastic viscosity of the SCC is estimated quite accurately from the measured viscosity of the paste following the procedure of the micromechanical model in which second phase particles (aggregates) are treated as rigid spheres.

It is the aim of this paper to develop a new simple approach to simulate the flow of SCC in the V-funnel test using a three-dimensional flow simulation containing aggregate particles of various sizes. This will provide a comparison tool for the discharge time with that suggested by the EFNARC guidelines. SCC mixes of varying strengths and performance were prepared to meet the flow-ability, passing ability and segregation resistance criteria using the slump flow, J-ring, L-box and V-funnel tests. The encouraging results of the numerical simulation in comparison with the results of the experimental tests confirmed the capability of SPH and the rheological model to predict SCC flow and mould-filling behaviour.

**Keywords**: Self-compacting concrete; SPH; Bingham parameters; V-funnel.