# An investigation of liquid bridge force between particles

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## ABSTRACT

Liquid transfer within granular materials can result in alteration of the physical properties of the material due to the formation of liquid bridges between individual particles. Capillary and viscous forces lead to complex and still not well understood granular behaviour. This can have a significant impact on various industrial processes such as coating, drying or granulation. Understanding how liquid is transferred in the micro scale between individual particles has been very challenging both experimentally and computationally [1].

The objective of the current work is the use of Computational Fluid Dynamics (CFD) and the Volume of Fluid Method (VoF), in order to:

1. Investigate the capillary forces due to the formation of a liquid bridge between a pair of particles.

2. Investigate the Viscous forces due to high wet particle collision velocities.

3. Develop a liquid transfer model applicable in larger scale particle simulations. Specifically we examine the liquid bridge rupture point and redistribution of the liquid on the involved particles, depending on liquid bridge volume, particle size ratio, liquid viscosity, surface tension and collision velocity.

The abovementioned microscale investigation can be used as a tool for the development of closed form expressions that can be easily used in a macroscale DEM-CFD simulation of a fluidized bed agglomeration process.

## REFERENCES

[1] C.D. Willett, A.J. Simon, M.J. Adams and J.P.K. Seville, *Pendular capillary bridges*, Elsevier, Handbook of Powder Technology, Vol. 11, pp. 1317 – 1351, (2007).

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