Investigation of procedures required for modelling of wet sieving using the coupled DEM-SPH method

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ABSTRACT

Wet sieving is commonly used in mineral processing technology for accelerating the separation of smaller particles from other coarser particulate fractions [1]. Modelling of dry sieving can be readily performed using a discrete element method (DEM) [2]. Liquid bridge forces should be taken into account when moist particles are considered [3]. However, the coupled analysis of the solid phase (particles) and the liquid phase should be considered in case of wet sieving. A study on the two-way coupled DEM-SPH was performed in [4] which demonstrated that the results of the DEM-SPH method agree well with the results obtained using the DEM coupled with cell-based CFD methods. The DEM-SPH code developed in [4] is therefore used in this study to perform a numerical analysis of wet sieving. Simulations utilizing the one-way coupled DEM-SPH, as was used in [1] and the two-way coupled DEM-SPH are performed to evaluate the influence of two-way vs one-way coupling. The positions of particles during two-way coupled simulation are shown in Fig. 1a. Initial simulation results of dry sieving together with results of wet sieving are presented in Fig. 1b. One of the difficulties, when modelling wet sieving, is that when a detailed representation of the sieve is used, a very low resolution of SPH particles is required to allow SPH particles to penetrate through openings of the sieve. Therefore, a simplified representation of the sieve, where the detailed geometry of the sieve is approximated by resistance forces is developed as a solution.

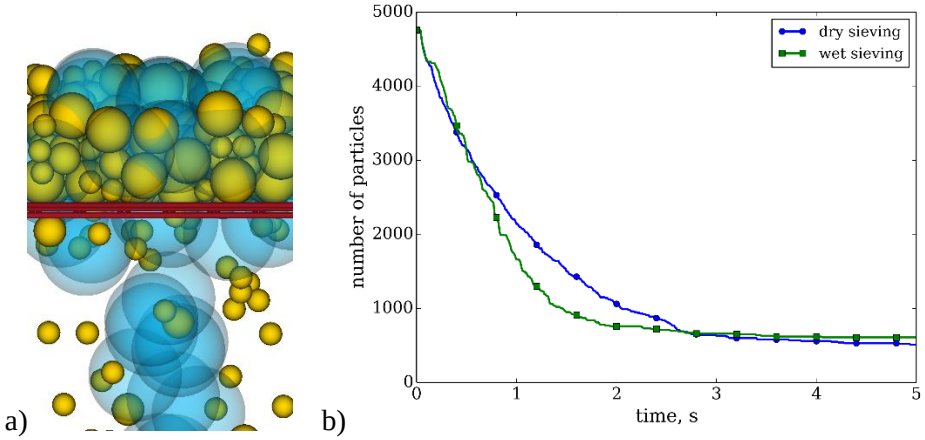

Fig. 1 a) Particle positions during the simulation of wet sieving; b) Number of solid particles above the sieve during the simulation

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