The presence of large objects immersed in a fluidized bed has been long studied in order to verify to what extent can the analogy with a buoyant body in a liquid represent the object-to-suspension interaction (1). One of the most useful information resulting from such study is the effective drag force exerted on the object and how it is related to the suspension properties, particularly with respect to the expansion degree. Implications are found also in the formulation of drag force expressions for homogeneous polydisperse systems. In the present work an experimental series of tests has been conducted on a 10 cm diameter, 2 m height fluidization column using glass beads in two sizes (300 and 600 µm) as solid and water as fluidizing medium. A 2.1 cm diameter sphere held by a balance was immersed and kept fixed at the center of the cross-section but free to move axially. Measurements of the hydrodynamic force were carried out at voidage values as high as 0.94, allowing the full range of bed expansion conditions to be covered. Different vertical positions of the large particle was also considered. Results for the drag force indicate that while at low and intermediate expansions the analogy with buoyancy works quite well, at higher voidage values, starting from about \( \epsilon = 0.8 \), the trend departs and additional force contributions are required to explain, though partially, the observed deviations.

REFERENCES