DISCRETE ELEMENT MODELLING OF THE COMPRESSIVE LOADING OF BULK AGRICULTURAL PARTICULATES: PARAMETRIC STUDIES

Abstract

When bulk viscoelastic particulate materials are constrained, individual particles will move and deform as an applied load is redistributed among the particles. The phenomenon of particle redistribution on the parametric changes is a complex one that cannot be easily obtained experimentally. Discrete element modelling is a numerical method capable of tracking the movement of individual objects within a bulk system and compute the resulting force and deformation as well as other parameters. The Discrete Element Method (DEM) has been used in this study to investigate the deformation of individual particles modelled as spherical objects with equivalent properties, porosity and other physical properties of the bulk system as well as other physical parameters during particle interaction within a bulk system subjected to a monotonic compressive load. Having developed and validated a code based on the Discrete Element Method principle with physical experiments the code was used to study and predict the behaviour (parametric changes) during compression of four bulk systems of particulates with the properties of canola seed, palm kernel and soyabean. The porosity predicted with the new code were compared with the original code without modifications; the new code which incorporated real system models for agricultural particulate gave lower porosity. Simulation results of other parameters showed variation in the bulk behaviour closer to what operate in the real system of particulates.